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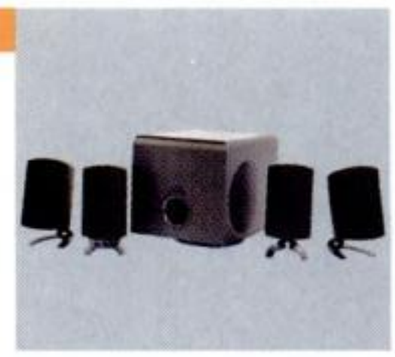

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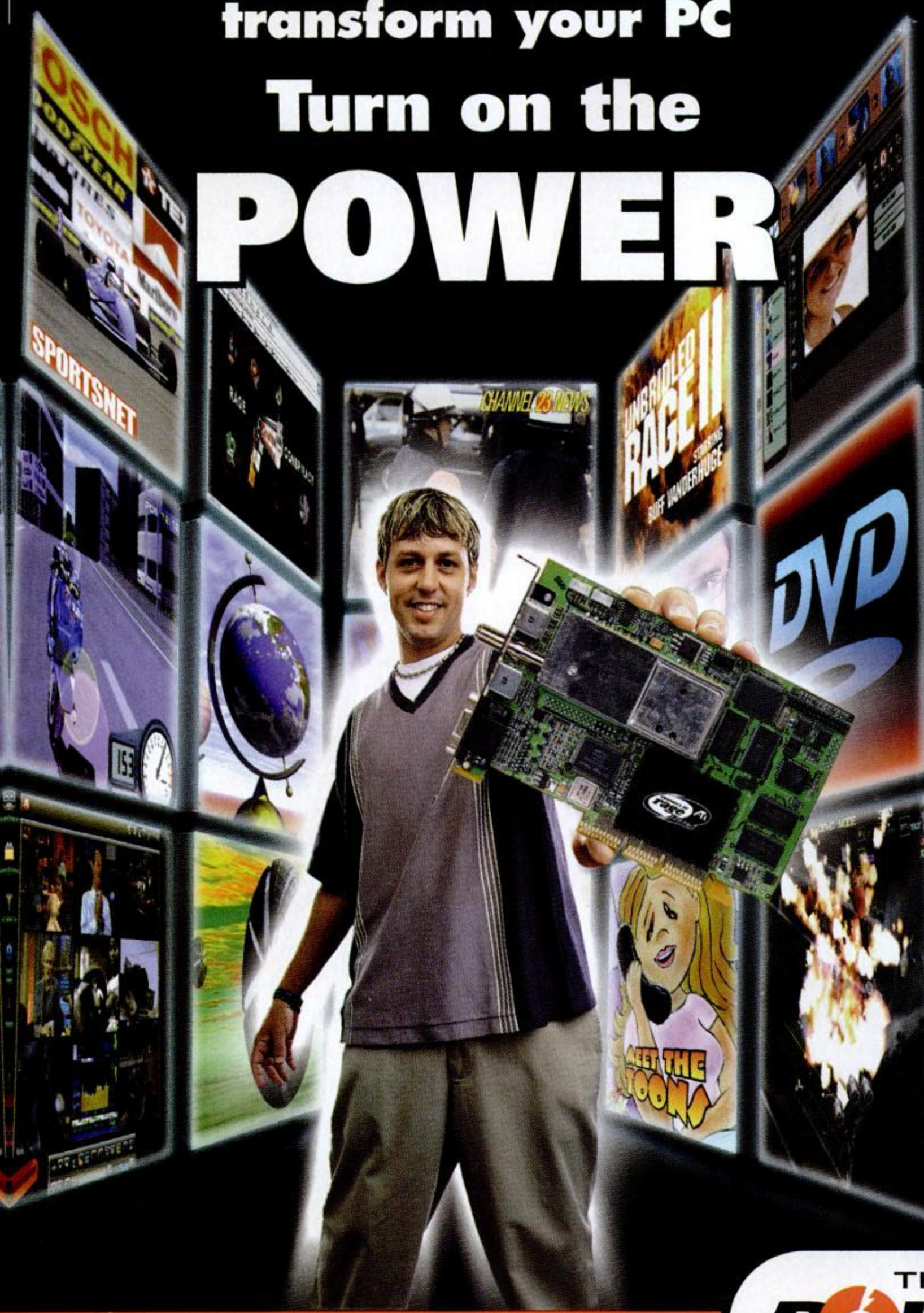

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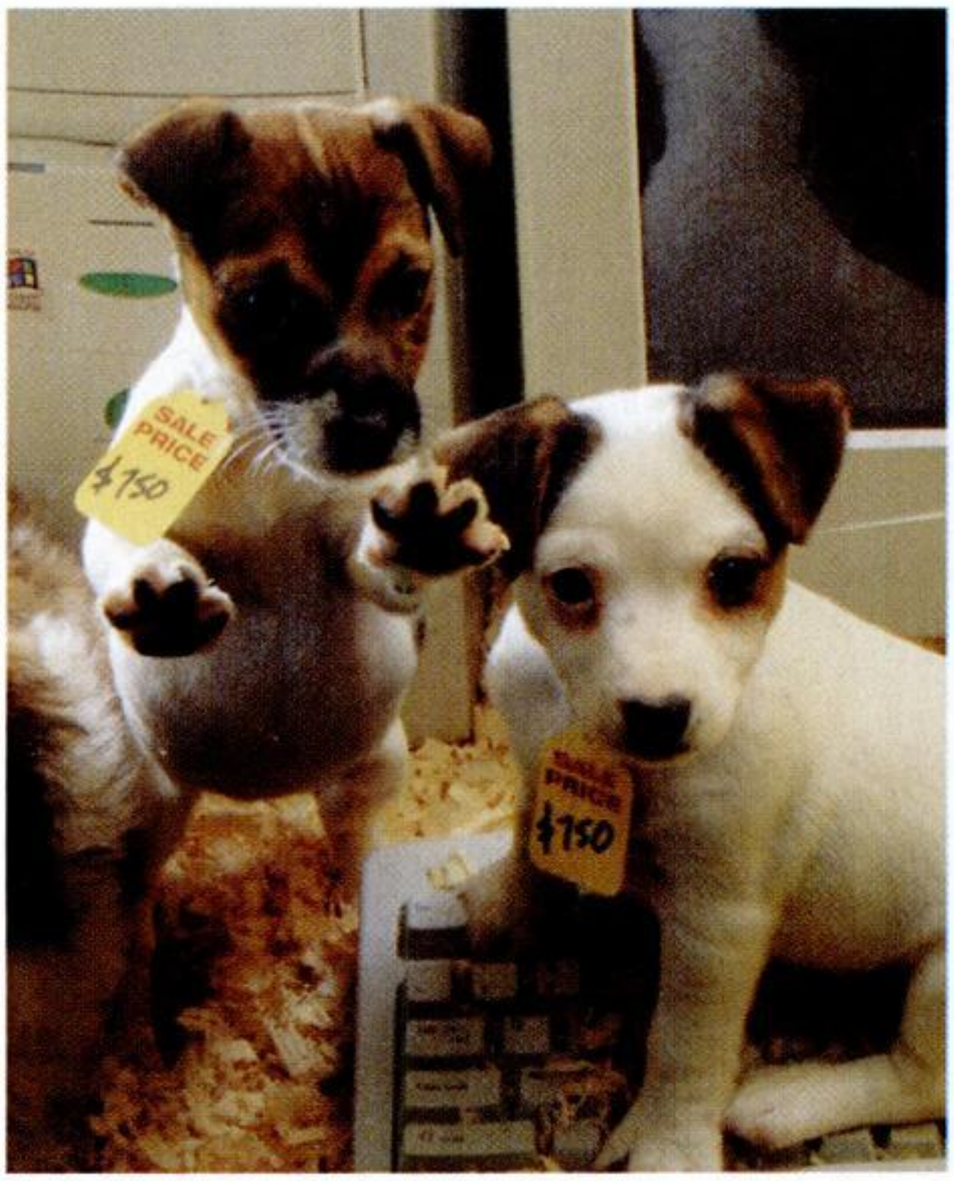
MAXIMUM PC

► MARCH 2000

38 Cheap PCs

The latest budget systems are as appealing as a puppy in a window, but are they just as much of a hassle? We look at six sub-$1,500 systems to find out what kinds of corners the manufacturers cut in order to put together such cheap PCs, and tell you how to inject some cajones into these simpering little beasties. We also tell you how these whelps stack up against the latest megahertz-thumping monsters.



61 Pixelicious

Just look at those luscious curves, arousing designs, and ultra-sharp images. The latest digital cameras have it all over their film-based brethren. Sporting megapixel resolutions and every new innovation that can be designed into their ergonomic cases, the new breed of digital camera will satisfy even the most diehard shutterbug. We pit four of these pixelicious powerhouses against each other in a head-to-head shootout. May the best one click.

52 Street Illegal

It may not look like much, but this box is the key that will unshackle you from your crappy car radio. It's a custom-designed PC that blasts your entire MP3 collection through your car stereo. Imagine more than 200 hours filled with only the music you want to hear. We show you how to built it in 11 steps.

COVER ILLUSTRATION BY RON MCPHERSON

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14 Comm Port
You have questions. Stop. We get a ton of mail. Stop. We run the best. Stop. We answer your questions without being rude. Go.

31 Fast Forward
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33 Net Sensei
Sherry Monarko is looking for a little corner of the web to put her stuff. What she's found is a host of virtual storage sites that offer space free of charge. What's the catch?

35 Game Theory
T. Liam McDonald checks the pulse of the adventure game genre and finds it barely alive. Who or what did it in?

104 Glitch
We take you ringside for the no-holds-barred cage-match between a porn collector and the software designed to hide overly exposed flesh from innocent eyes. Snap into some skin, Jim.

Eyeguard, p.104

▶ NEWS

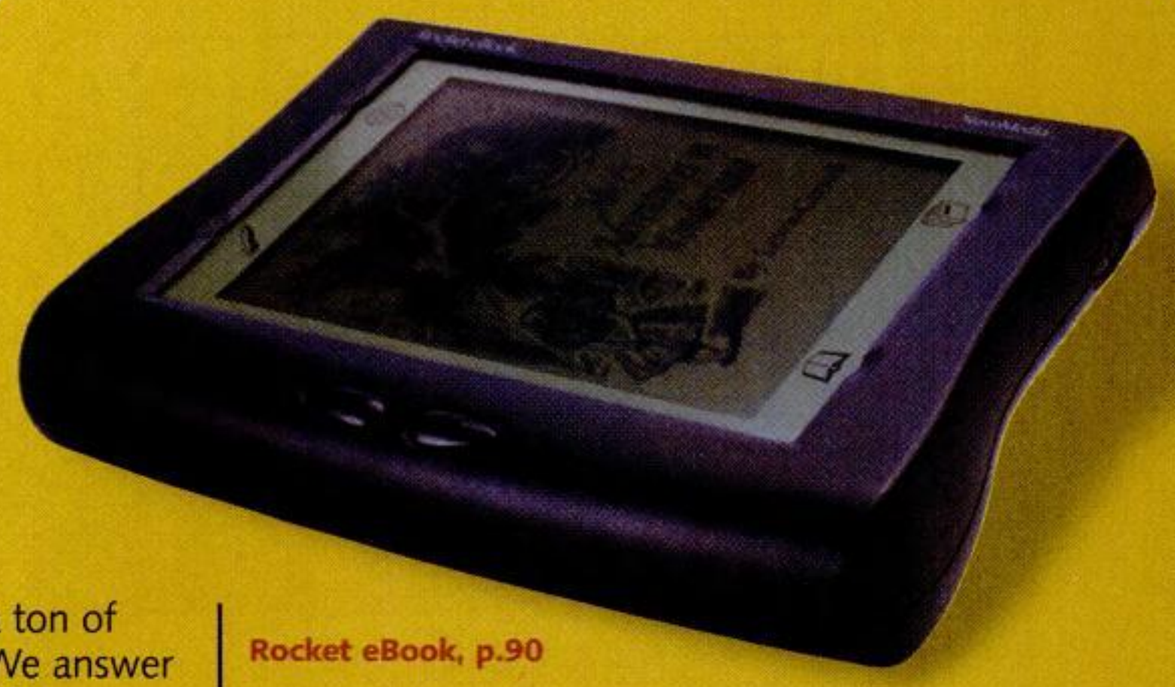
20 Inside Sources

PC Previews, News, and Factoids

▶ No room in your case for a CD-RW, DVD-ROM and CD-ROM? New combo drives will solve your dilemma. Also, SCSI users again get more to boast about, as Ultra160 adapters hit the market. And a clear disc that holds 140GB of data is due to change the way your store your MP3s.

Spin Cycle: Free Kevin? Yup. The world's most famous hacker gets sprung, TransMeta and Linus Torvalds unveil a new x86 compatible CPU named "Crusoe," and DVD pirates, er, archivists, take one on the chin.

21st Century Storage, p.20



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▶ TECH FILES

25 Watchdog
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67 White Paper
As memory gets faster and faster, the technologies behind it get more and more complex. That's why we put together this field guide to RIMMs, SIMMs, and DIMMs.

71 Ask the Doctor
Hard drive deception, and the final word on installing a new motherboard in a Dell.

102 Terminator
Look here for any word that looks like this.

▶ PRODUCTS

29 Peripheral Vision
The Home Theater PC boasts everything you need to run an entertainment center; the funky VoicePod boasts nothing you really need, but looks pretty cool; and the CardScan Executive reduces your stack of business cards and makes Gordon go ga-ga.

Home Theater PC, p.29

75 Reviews
The **Dell 800MHz Coppermine** reviewed this month is so bad-ass, we had to put on sunglasses on just to look at it. **Time machine** software lets you roll back your system in an emergency, and since it's almost April 15, we have **Tax software,** too. Hardware junkies can check out the **ATI Rage Fury Maxx**, the **Razer Boomslang** mouse, and a trio of **Internet keyboards.** For those of you working online, check out Macromedia's **Dreamweaver 3** and **Fireworks.** And last but not least, we welcome back **multifunction printers**.

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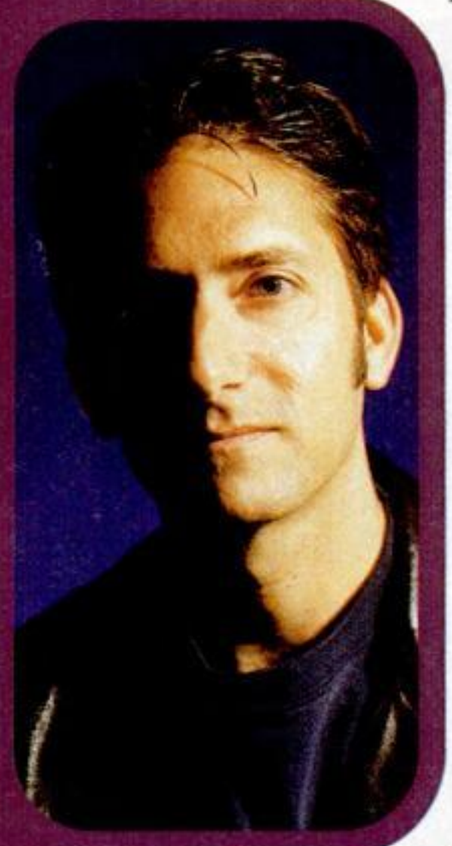

In my January column, I described the configuration of an imaginary "Perfect 10" system, and dared the world's OEMs to send us such a rig for review. My fantasy PC was packed with so much power and so many extras, I thought it would take many months before technology, imagination, and economies of scale would intersect in such a way as to allow an OEM to offer a Perfect 10 system for a feasible price.

The bad news for me: I sorely underestimated the vision of system vendors, and the shifting tides of "the market."

The good news for you: Pre-fab systems are better than ever.

On page 76, we award a Perfect 10 verdict to a decadently furnished Dell PC. This system meets most of my stated prerequisites, which actually described an off-the-scale 12 or 13 verdict. But what really defines this computer is a videocard of singular audacity—a GeForce-based screamer that features not only rare and supremely powerful Double Data Rate SDRAM, but an unprecedented *64MB* of the stuff. If you want this card, you'll have to buy it in a Dell system, because it's not currently available as an add-in part.

Nice little flourish, Dell. By integrating a part that is literally beyond the reach of the individual hobbyist, you've built a system that can't be replicated by us in our Lab, or by our readers in their homes.

We won't begrudge Dell its Perfect 10 award, but we must point out that only fat-cat OEMs like Dell have the financial inertia to offer so much power at a competitive price. And this is where technology intersects with economies of scale: Three years ago, only small OEMs such as Polywell and Falcon Northwest were offering true power boxes aimed at the hardcore gamer-tinkerer-hobbyist—and they were selling these machines for a pretty premium. But since then, the price of high technology has dropped dramatically, and the ultra-high-end has become mainstream.

Because they sell so many systems, and can purchase palette after palette of core components at rock-bottom prices, the Dells of the world can now configure and sell kick-ass PCs for far less money than the small-fry vendors. This is good news for Dell stockholders, but bad news for anyone who laments the "good old days" when only a company like Falcon Northwest had the foresight to integrate a newfangled "3D card" that would allow you to play *Quake* with bilinear filtering enabled.

So Dell wins its Perfect 10—and now the *real* scrutiny begins. In the coming months, we'll run torture tests on the Dell Dimension, and tax Dell tech support in ways it's never imagined. Our goal: to find out once and for all whether the small-fry vendors are still relevant. Humble vendors like Falcon Northwest have always been heralded as paragons of engineering acuity and personalized service. Meanwhile, the rub on large OEMs has been that their corporate bureaucracies beget slapped-together systems prone to engineering problems. And when these assembly-line systems inevitably break down, the folks in central tech support are about as qualified to help as your old Aunt Minnie.

We must point out that only fat-cat OEMs like Dell have the financial inertia to offer so much power at a competitive price.

Can Dell prove this conventional wisdom wrong? We shall see. One thing's for sure, though: Initial testing indicates Dell is selling one hell of system. Let's just make sure it's still a Perfect 10 six months from now.

Jon Phillips, editor-in-chief

MAXIMUM PC

mar00 vol5issue3

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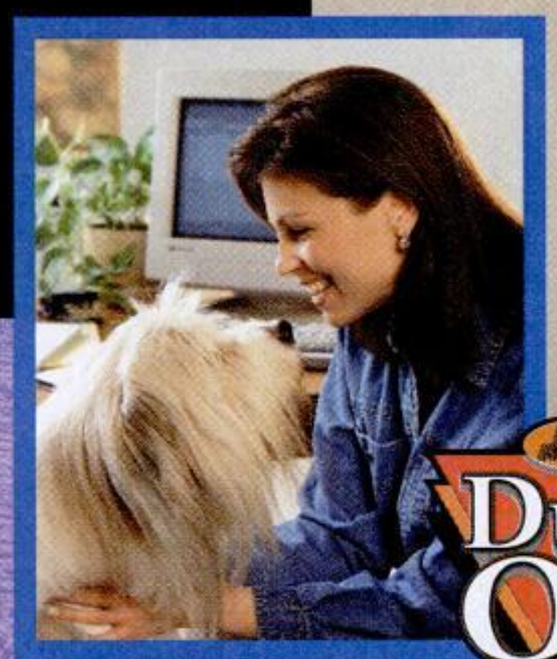

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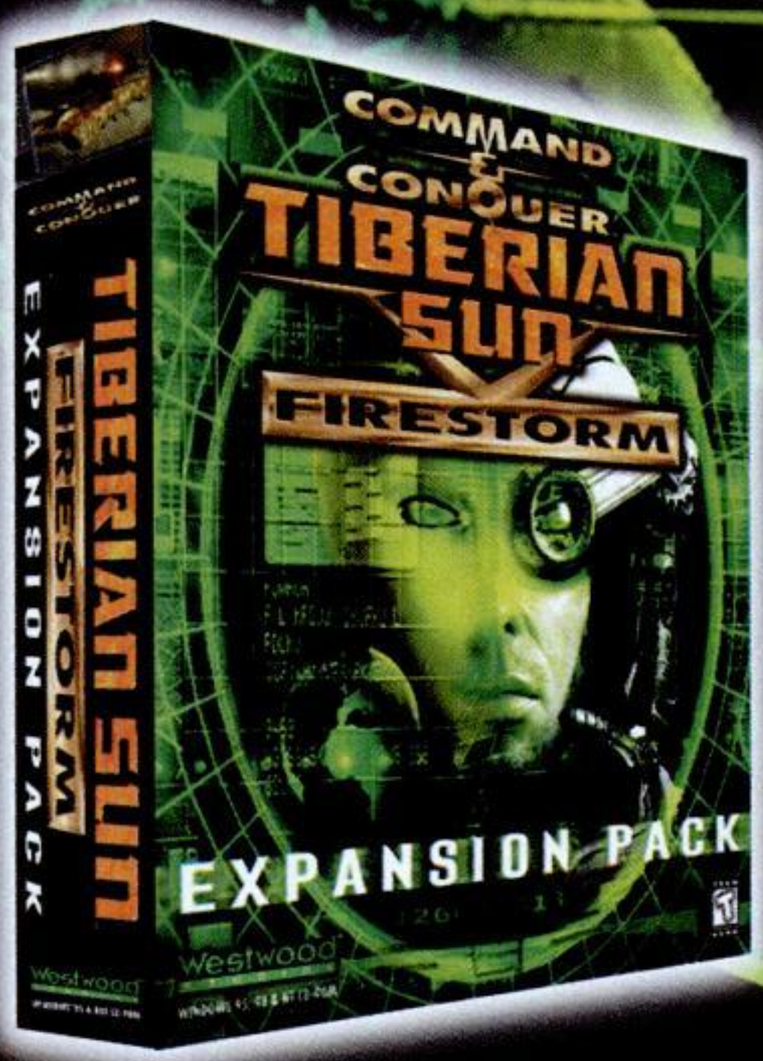

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LETTERS

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Let's Hope Open-Source Doesn't Lead to Open Sores

Right after our January issue hit mailboxes and newsstands, we began receiving e-mail pointing out a factual inaccuracy in Jon's Edword column. Jon had incorrectly declared that "our editorial staff has never awarded a perfect 10 to any desktop PC. Not once since the birth of *Maximum PC*, and not once during the run of *boot* magazine, *Maximum PC*'s primordial earth mother."

This is, of course, just plain wrong. In September 1997, *boot* magazine awarded a perfect 10 to a 266MHz Micron Millennia XRU. While peeling through our electronic reviews database, Jon incorrectly registered the machine as a workstation, and thus was born his snafu. This month, the *Maximum PC* staff awards its *second* 10 verdict to a desktop PC. See page 76.

The Reader of the Month award goes to Mark Sebransky, who sent us late-breaking news that *Napster* server source code had been reverse-engineered and posted online. *Napster* is, of course, the amazing—and somewhat scary—MP3 searching utility; read all about it in last month's issue. Now that the software is effectively open-source (**http://opennap.sourceforge.net**), the "fun" begins. Can you say "security hole"?

And with that, your letters...

The Truth About Toy Story Graphics

In your January "Millennium Survival Guide," you state the machines that rendered *Toy Story* spent "hours chugging through ray-traced graphics." It is a common misconception that high-quality rendering is synonymous with ray-tracing. In fact, there is not a single ray-traced pixel in *Toy Story*. The Pixar renderer, *prman*, uses the REYES algorithm, which does not involve any ray-tracing. The shiny reflections in Buzz's helmet and elsewhere in the film were done with reflection maps. It's also worth noting that *prman* deals almost exclusively in high-order surfaces such as NURBS patches, subdivision surfaces, and quadrics. Polygons are rarely used, making it difficult to compare *prman* to the hardware-based rendering engines used in PC graphics cards, for which triangles are the world.

Even if you had a whiz-bang 3D card that could crank out images that were, in some sense, comparable to *Toy Story*, the 3D content would still need to benefit from the brilliant technical directors, procedural shader programmers, and cinematographers who spend days, weeks, and months getting any given shot to look "just right."

"*Toy Story*-quality" has less to do with technology, and more to do with producing the best possible illustration of an entertaining, well-crafted story.

—James W. Williams, former technician, Pixar

Beam Me Up, Gordy

I have been driving myself nuts trying to find the *Star Trek* image that was on the Win2000 desktop pictured on page 20 in the January 2000 issue. Can you guys tell me where it came from?

—Mike Russo

Lt. Cmdr. Gordon Mah Ung responds: If you're a Starship junkie, look no further than **http://members.aol.com/wolfpak359/** for high-res, 3D-rendered images of Starfleet. The one pictured in the mag was the *USS Ticonderoga* by Eric Peterson. The site also features images of the *USS Enterprise* and *USS Defiant* as well as ships from *Babylon 5* and *Star Wars*.

I have been driving myself nuts trying to find the Star Trek image that was on the Win2000 desktop in the January issue.

Maximum Rebound

Had I known that you could get Reader of the Month award just by dissing the December issue, I would have gladly supplanted Mr.Fenton! I also thought the issue sucked. For that matter, so did the January issue. So what? I also knew that the next issue would be exactly what the doctor ordered. Just yesterday, I was trying to help a friend decide on a CD Recorder. Now, thanks to *Maximum PC*, we don't have to wonder! I also needed some guidelines for online investing—that's taken care of! Last but not least, The Complete Guide to MP3s! Need I say more? I'll gladly sift through some so-so issues to find a gem like the February issue. I was going to let my subscription lapse, but not anymore.

—Maurizio Menetto

Editor-in-chief Jon Phillips responds: We don't typically run "fan letters" because they reek of self-aggrandizement, but Maurizio's letter perfectly illustrates how the shifting tides of our content can serve different readers at different times. It's impossible to deliver exactly what all of our readers want in every issue, because our readership has such diverse needs and interests. But individual readers can help us by sending brief article requests to **editor@maximumpc.com**. Determining coverage is a very inexact science, but we do pay attention to the squeakiest wheels.

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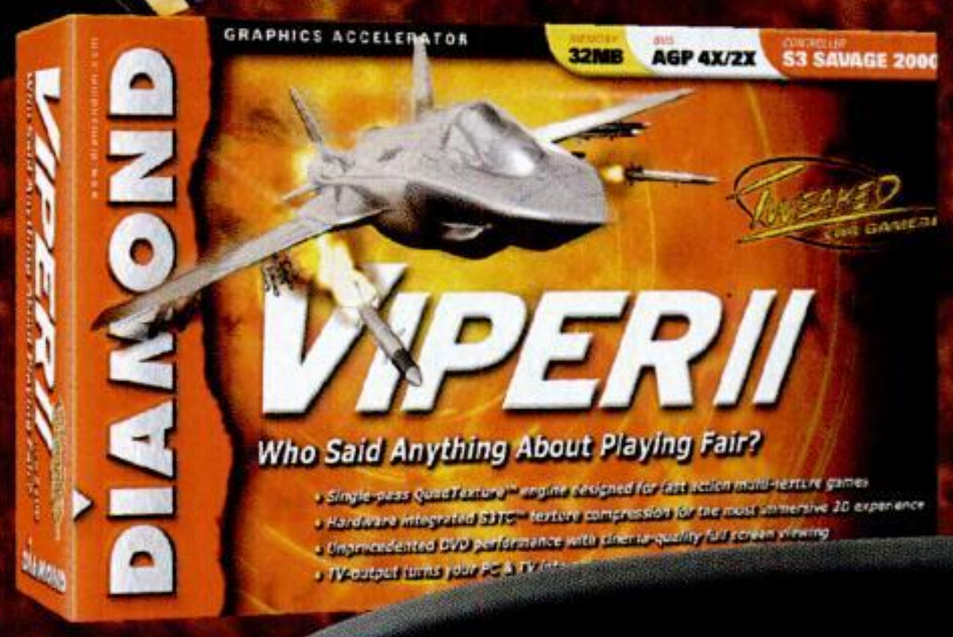

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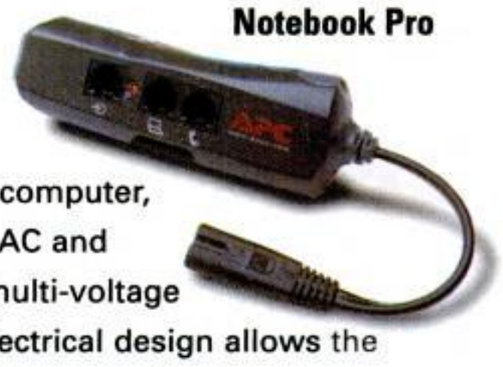

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COMMPORT

When Millimeters Count

I would like to comment on Josh Norem's review of the Microsoft IntelliMouse Explorer [January 2000]. I don't dispute anything he wrote in the review; however, I believe one important aspect was omitted. For AutoCADdicts like myself, the IntelliEye technology provides an absolutely dynamic enhancement to the overall control of the pointing device. In an application where distances of thousandths of an inch or tenths of a millimeter can make or break a project, this enhanced control helps pull drawings together that much faster.

—Ric Kinney

The IntelliEye technology provides an absolutely dynamic enhancement to the overall control of the pointing device.

Why 3D Games Don't Need 64-bit CPUs

In his January column about 64-bit chips, Tom Halfhill made a statement that I found to be very out of touch. He stated that people really don't have a need for 64-bit chips, except in high-end servers. Then he mentioned 3D graphics, and that put a nail in his statement. Is there a game made today that doesn't use 3D graphics? Everyone needs a faster processor—64-bit, if that's the best we can get. Obviously, the only thing this guy runs on his PC is Microsoft Office!

—Michael Winslow

Contributing editor Tom Halfhill replies: Of course I realize games use 3D graphics. But games use 32-bit 3D graphics because greater numerical accuracy would be wasted on a video screen. You don't need a 64-bit processor for 32-bit graphics. All current x86 processors *already have* FPUs (floating-point units) with 64-bit datapaths. In fact, the datapaths are 80 bits wide. But not a single game on the market manipulates 3D graphics as 64- or 80-bit data types. Future x86 processors with SSE will probably have 128-bit datapaths so they can handle four 32-bit values at once. SSE already has 128-bit-wide registers. But that still won't require 64-bit datapaths in the integer pipelines, which is what AMD is working on. *[Michael: You just experienced what we like to call a "smackdown." Sure it hurts, but pain breeds character. Carry on, and keep gaming! –Ed.]*

Asus is Aces

In the February 2000 issue, you did reviews on two Athlon motherboards, the FIC and the MSI. I would like to know why you left out the other contenders, the almighty Asus K7M and the Biostar Athlon mobo. Although I have no love for the Biostar, the Asus is a killer board with excellent features. In my opinion, if you put it next to your MSI board, it would blast it out of the water, and score a perfect 10 (just make sure you have the second release of the board). I'd love to see an all-out comparison among all of the Athlon mobos, as I am a great AMD fan.

—Jerry Billings

News editor Gordon Mah Ung replies: Jerry, we tried and tried to get other Athlon mobo companies to come out and play, but none had the guts except for MSI and FIC. Asus has already earned a reputation for being wishy-washy about its Athlon support. For the past few months, the Taiwanese company was downplaying its Athlon board. In fact, Asus only recently acknowledged the board on its web site.

Many conspiracy theorists postulate that Asus doesn't want to offend "a large company" that makes a Slot 1 CPU. We asked Asus for Athlon review boards, and their official response was that the boards were intended for OEMs, not home hobbyists who build their own systems. But maybe the situation has since improved (we made our first calls more than three months ago). Expect more Athlon mobo coverage—especially coverage of VIA's new KX133 chipset—in the coming months.

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– **Fred Lugano**, weatherization.com, Vermont

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Thank You, Sir; May I Have Another?

I have watched *boot* become *Maximum PC* and change significantly during the last year in terms of both format and personnel. It remains my top PC magazine. One thing that hasn't changed (for good reason) is the distinguished Kick Ass award. In this regard, I believe the following link might be of interest to you: **www.fred.net/turtle/asskicker/asskicker.html**

—Bob Cook

Editor-in-chief Jon Phillips replies:
Ouch! But does it come in a USB version?

Booming Like an 808

I'm sure Tom Halfhill has already received other feedback, but just in case: The very first IBM PC did not have an 8086 processor in it [Fast Forward, January 2000]. I know because I was disappointed with IBM when it announced its first computer. This machine came with the 8088, despite the fact that the superior 8086 was already shipping.

—Ben Yaschik

Contributing editor Tom Halfhill replies:
Contributing editor Tom Halfhill replies: About the 8086 vs. the 8088: Yeah, I knew that. I'll blame it on a brain fart. The 8088 was identical internally to the 8086, but had an 8-bit I/O bus instead of a 16-bit bus. IBM picked the 8088 for the original IBM PC because it worked with less-expensive, 8-bit peripheral chips, though at the cost of some performance. Many of the early PC clones used the 8086 to exploit this difference.

You remember booting the OS from a single 360KB floppy? Hah! That's nothing. My first home computer was an Atari 800. When I was lucky enough to afford a floppy drive, the disks stored only 88K each. Before that, I booted the OS from ROM—which was actually an advantage. Booting was instantaneous, the OS couldn't get corrupted, and upgrading the OS took only seconds by swapping cartridges. Ah, the good old days. Thanks for writing.

2D Matters

It was nice to finally see someone take a breather from the frame rate-crazed world of 3D gaming, and do an article on the state of 2D in the current generation of video cards [Lab Notes, February 2000]. But I was disappointed that you didn't comment on the most important part of 2D performance: image quality. You can have the best monitor in the world, but it won't do you a bit of good if your videocard is spitting out a fuzzy signal.

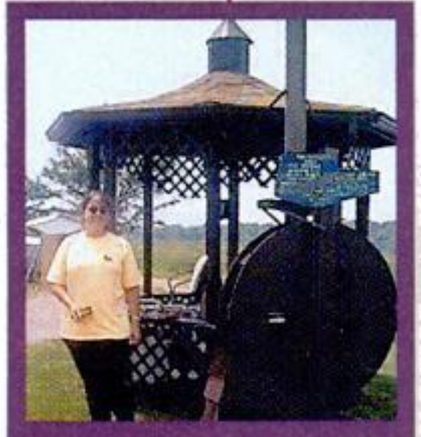
2D speed differences among different cards are minimal, but the quality of the image can vary greatly—not just among chipsets, but among manufacturers as well. Having seen a bunch of different cards on the same monitor, the best picture around comes out the back of a Millennium G400 MAX. Compared to this, everything else seems like you're looking through someone else's glasses.

—John Bell

Double DIMM

I beg to differ with your recommendation that one 128MB DIMM is just as good as two 64MB DIMMs [Ask the Doctor, February 2000]. Have you ever had intermittent troubles that cause your computer to hang during boot up? What about removing all "non-system-critical" hardware to isolate the guilty party? Having that second DIMM makes trouble shooting so much easier, and keeps you running while you replace the bad memory. I have had two DIMMs go south on me in the last year. Having the extra DIMM is well worth the extra cost. Any mobo worth its salt will have three slots, so you still have one for expansion.

—anonymous



Ouch! But does it come in a USB version?

We Can Play the Market, But We Can't Play Our Readers

Your article about online investing (February 2000) did a good job of covering a deep topic in a relatively small space. However, the analysis of Bryan Del Rizzo's results hit a common snag: ignoring commissions in tallying profit and loss.

Though the details of each trade in Mr. Del Rizzo's portfolio are not given, we can see that he bought and sold 10 stocks for a total of 20 transactions. At the rates quoted for the four online services reviewed in your article, those 20 transactions could have cost anywhere from $240 to $600. At best, this reduces Mr. Del Rizzo's profit from the stated $253.37 to a paltry $13.37. At worst, Mr. Del Rizzo is going to be washing dishes in the *Maximum PC* cafeteria for quite a while to pay back his $447 loss.

You aren't the first to forget commissions and fees when computing results. This is a lesson that all investors—particularly day traders—need to learn.

—Roy Swonger

Editor-in-chief Jon Phillips replies:
We did indeed ignore commissions when tallying our final profit/loss results. Fact is, we took shortcuts for the sake of creating an easier to read chart. A truly accurate chart would have included not only commission expenses, but also the interest earned by our money market accounts. (When you create an account with an online broker, the broker actually invests your initial payment in a safe, interest-generating money market fund—so even if you don't play the market, you'll still realize modest gains!). Our intent was simply to illustrate the benefits of playing a hot bull market. We apologize for the missing information.

One Can Only Dream

Here's the foundation of my "Wet Dream Machine":
- CPU: 80,000MHz AMD GoddamnI'mCrazy with 3DNow!
- Memory: PC3000 Direct RDRAM
- Videocard: Bitchin'Fast!3D^{2000}
- Soundcard: THX powered by Skywalker Ranch
- Monitor: That big-screen display in Times Square
- Mouse and Keyboard: Cerebral-connection implants in brain
- Internet Connection : Shotgun-style dual DSL
- Case: Maximum Server Tower with nuclear generator power supply (comes with small electric company to supply juice to the cooling units)

Kick Ass award? You decide.

—Troy Boulware

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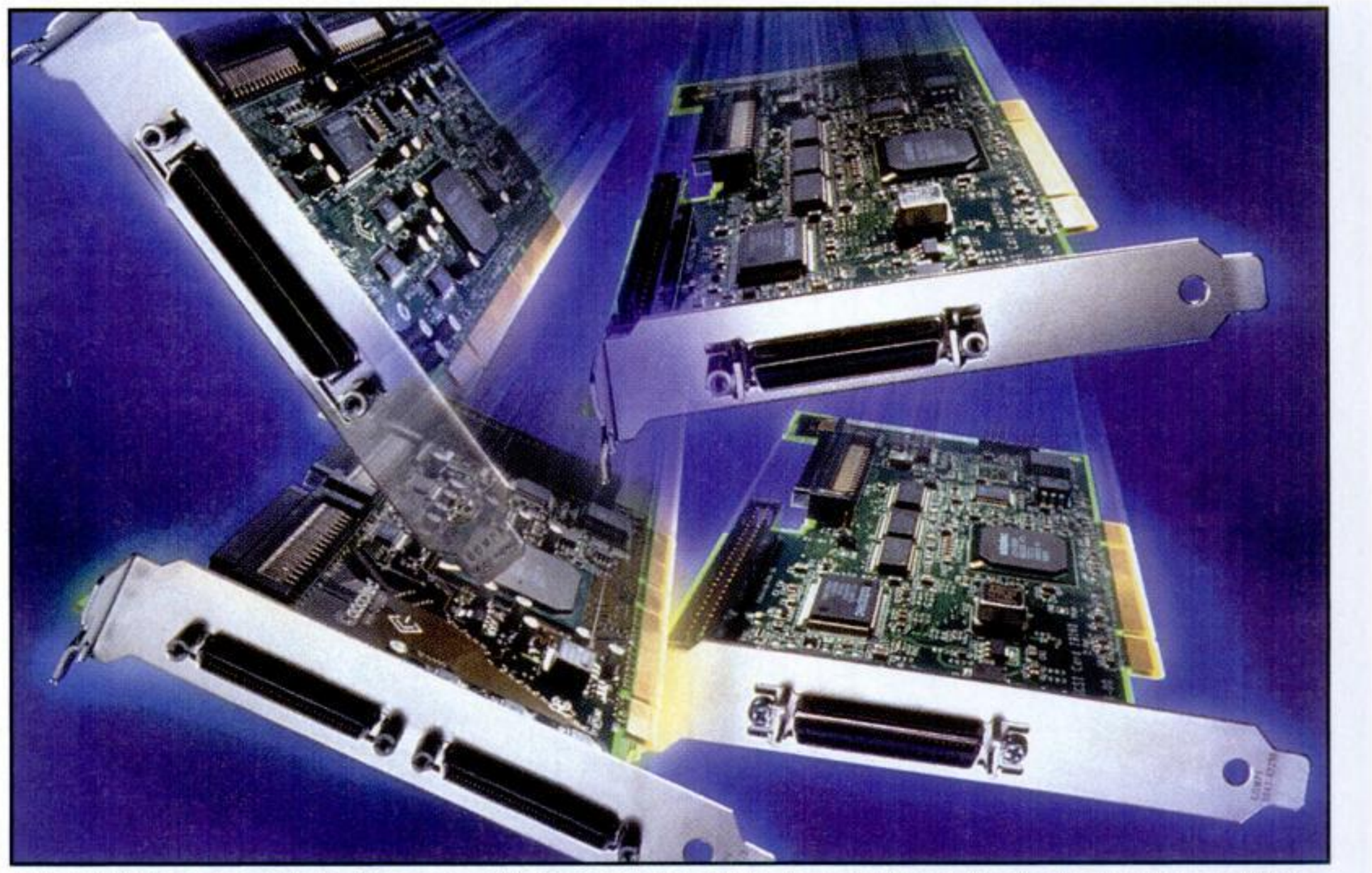
Double Your SCSI

If you've been clutching an Ultra160 hard drive to your chest and wondering when you'd finally be able to buy a controller card to exploit its performance, your wait is over. By the time you read this, controllers that support Ultra160, the successor to Ultra2 SCSI, should be on store shelves.

Although the Ultra160 spec was introduced more than a year ago, and drives have been available for several months, Ultra160 controllers are just now being sold. SCSI card makers say sales were delayed in order to run quality assurance testing with the new drives.

Ultra160 doubles Ultra2's 80MB/sec maximum throughput to 160MB/sec. The key is double-edge clocking, which transfers data on both the rising and falling edges of the REQuest and ACKnowledge clock. This double-edge clocking is handled inside the drive itself, reducing incompatibility with older drives.

But don't expect to get 160MB/sec speeds from a single Ultra160 drive. It'll take several drives working in harmonious RAID concert to achieve full speeds in a system using a 64-bit PCI Ultra160 controller. Ultra160 adds cyclical redundancy checking for data integrity, reduced file corruption, and domain validation. Ultra160 also intelligently detects peripherals connected to the interface, and ensures the highest data rates possible. This is especially important, as both Ultra2 and Ultra160 devices can be used on the same cable.



Ultra160 SCSI cards and hard drives are out to show you who is the boss of whom. Adaptec will replace its entire **Ultra2 line by April with the four U160 cards shown above.**

Ultra160 drives are now shipping from Fujitsu, IBM, Quantum, and Seagate, with matching SCSI adapters expected from Adaptec, Asus, DPT, Iwill, LSI Logic, Mylex, nStor, and Qlogic.

Ultra160 drives are already using the latest mechanical hard drive technologies, meaning much higher rotation speeds and capacities, and lower failure rates. Seagate's new Ultra160 Cheetah, for example, features up to 16MB of onboard cache.

DVD-CDR Combos

Last year, infant DVD-ROM technology learned how to crawl. This year, it's poised to walk, run, swim, and fly. Engineers have successfully cross-bred DVD-ROM technology with CD-R/RW technology,

SPIN CYCLE

This month's top stories broken down ►

HEADLINE	NEWS	DETAILS	THE SPIN	OUR TAKE
TransMeta Unveils "Smart Microprocessor"	Secretive TransMeta broke a year-long vow of silence to introduce its Crusoe CPUs for use in mobile devices.	Running from 333MHz to 700MHz, TransMeta's chips will use a technique called "code morphing" to run native Intel x86 instructions.	Operating on extremely low amounts of power, TransMeta will target the portable Internet Appliance market.	With Linux mastermind Linus Torvalds as an employee, TransMeta is poised to be the Intel of tomorrow.
Famed Hacker Free	Kevin Mitnick, the hacker both revered and demonized, has been released from federal prison.	Mitnick spent nearly five years behind bars, some say unfairly, after being arrested for hacking computers.	"My actions and my life have been manipulated and grossly misrepresented by the media since I was 17," Mitnick said.	Mitnick's actions aside, the Feds gave him a bum deal by holding him nearly four years while awaiting trial.

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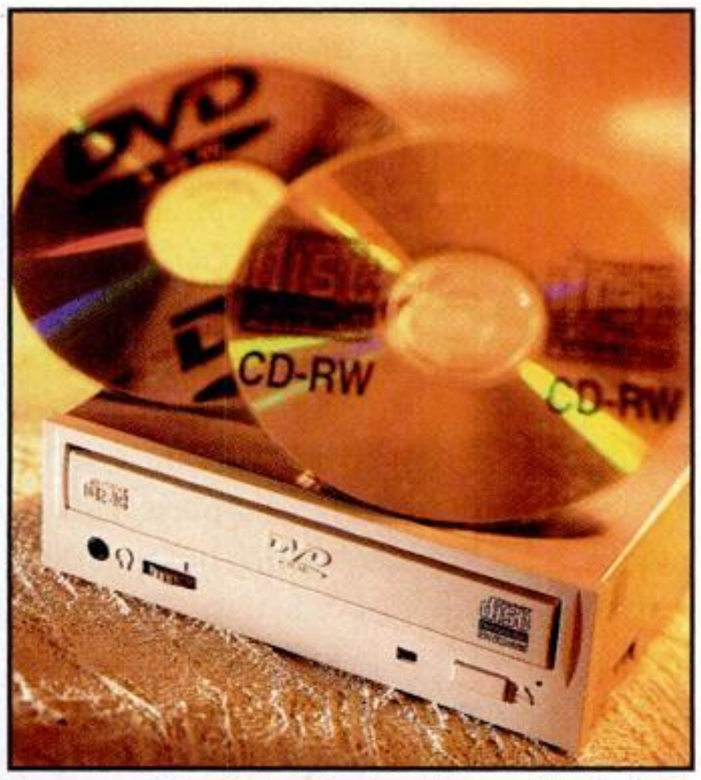
and the results look promising. Just don't confuse these new combo drives with rewritable DVD technology; the new drives will burn only CD-R and CD-RW media.

Although combo technology that reads CD-ROM, CD-R, CD-RW, and DVD-ROM may sound like an expensive, complicated, multi-head fiasco, this just isn't so. Combo drives actually use a single head to read all media. The first wave of combo drives uses a modified CD-RW assembly with two laser diodes that control laser strength: One laser setting will run at a low-power, 650nm wavelength to read DVD-ROM media, while the other will run at a high-power, 780nm wavelength to read CD-R/RW and CD-ROM. Advanced firmware orchestrates this show, and a heftier-than-normal cache buffer of 2MB to 4MB helps prevent buffer underruns.

While companies such as Acer, Samsung, Ricoh, and Toshiba are betting consumers will embrace the new technology, other vendors—such as Panasonic, Philips, Pioneer and Plextor—are on the fence.

First-gen combo drives debut in a variety of speeds. Toshiba's SD-R1002 is 4x CD-Record, 4x CD-ReWrite, 24x CD-ROM read, and 8x DVD-ROM read. The drive will be offered with an ATAPI interface and 2MB buffer, and cost under $400. Samsung's SM-304 combo drive, which should already be on store shelves, offers slightly slower DVD-ROM reads with a performance rating of 4x/4x/24/x/4x. Ricoh will soon offer a combo drive that bumps CD-R speeds up to 6x, and Acer is working on a drive that runs at 8x/8x/32x/8x. Acer says this ATAPI drive will contain a 4MB cache and cost less than $300—but it won't appear until early 2001.



Free your drive bays. Combo drives will eliminate the need for separate DVD and CD-R/RW drives.

Are people ready to buy these all-in-ones? It depends on whether the drives can reach advertised speeds and sell for under $400. Yamaha is skeptical, and has scraped its combo drive to concentrate all efforts on CD-RW. Performance enthusiasts may not embrace the new drives either. Currently, standalone DVD, CD-R, and CD-RW drives far outperform the combo drives, and no companies will offer SCSI interfaces on combo drives in the early going.

140GB on a Silver Platter?

Millennial visions of sexy, high-capacity drives may well be fulfilled this year if Constellation 3D (C3D) has its way.

C3D (**www.c-3d.net**) says it has developed an optical drive technology called Fluorescent Multi-layer Disc and Card (FMD/C) that can read and write more than 140GB on a single transparent CD-ROM-sized disc. FMD/C drives are expected to support traditional CD-ROM and DVD-ROM media.

So how does the technology reach such high capacities? In a nutshell, FMD/C uses a laser to activate fluorescent material embedded in the pits and grooves of a transparent disc, then interprets the light produced from that material. Unlike a DVD-ROM, which tops out at two layers per side, FMD/C can sandwich together many more layers—and each successive layer adds to a disc's total capacity. Initial versions will contain 10 layers for 140GB of storage, and will be read-only. Eventually, C3D expects to use 100 layers, for more than one terabyte of storage capacity.

The technology may sound like vaporware, but products using FMD/C are expected to ship as early as the end of 2001. The industry is also taking FMD/C more seriously than other competing high-capacity technologies, because C3D's founders are veterans of the optical storage field.

C3D says its discs won't cost more to produce than current CD-ROM media, and manufacturing plants will only require "minimal retooling" to make their production equipment compatible. In fact, since FMD/C storage media is transparent, manufacturing processes can be simplified: The media doesn't require the application of the reflective layer used in today's media.

What does this all mean to you? Well, don't hold your breath or halt any purchasing decisions. FMD/C may sound promising, but it currently suffers a few market-entry barriers. While FMD/C drives will read DVD and CD media, FMD/C media won't be read by DVD and CD-ROM drives. Also, for FMD/C to proliferate, it'll first need a large OEM win from a company such as Compaq or Dell.

—Sean Cleveland

to the pertinent details.

HEADLINE	NEWS	DETAILS	THE SPIN	OUR TAKE
Judge 86s DVD Piracy Tool	A federal judge has ordered three web sites to remove a file that allows people to copy the contents of DVD movie discs.	The program, called DeCSS, allows users to copy encrypted DVD files onto PC hard drives and DVD-RAM drives.	Hollywood says DeCSS violates the Digital Millennium Copyright Act, which outlaws tools that circumvent copyright protection.	Hollywood can't stop digital progress. Someday, we'll all be downloading *Scream VI* with *Napster For Movies*.
Be Free Again	Be, the alternative OS, is again going freeware, to shift focus to the Information Appliance space.	Starting with rev 5, the company will again let any individual download BeOS at no cost, as development shifts to the Stinger OS.	"The post-PC revolution of Internet appliances has started," said Be CEO Jean-Louis Gassee.	After years of bleeding money, Be will either be made or broken by this Information Appliance play.

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fact check ► 3D gaming

AGP 4x: Do You Comply?

In the months since AGP 4x videocards and mobos have become available, gamers have cried foul over an alleged lack of AGP 4x compliance in nVidia GeForce and Matrox G400 cards. Just what *does* it mean to carry the AGP 4x logo? An examination of the AGP spec shows there's a gap in definitions among those who care.

AGP Appears

In 1997, Intel created the Accelerated Graphics Port in response to the limited bandwidth of the PCI bus. When videocards sat on the 33MHz PCI bus, they had to share bandwidth with network traffic and I/O devices such as hard drives. PCI videocards were handcuffed by the competing traffic, not to mention the 133MB/sec transfer limit of the PCI bus. This slowed down frame rates as game visuals became increasingly complex.

AGP offers a point-to-point connection between the core-logic chipset and videocard. Its most basic form is AGP 1x, which jacks up the bus frequency to 66MHz. Because it's really just a variation of the 66MHz PCI spec, AGP 1x doubles the speed of basic PCI transfers, but doesn't do much else. The real deal came in AGP 2x, which allows two 32-bit transfers per each 66MHz clock cycle, for an effective bus speed of 133MHz.

AGP 4x doubles throughput once again to four 32-bit transfers per clock cycle, yielding just over 1GB/sec of throughput and an effective bus speed of 266MHz. Because of its stringent timing requirements, AGP 4x calls for a voltage setting of 1.5V, which allows for smaller peaks and valleys in electrical signaling. Both AGP 1x and 2x operate on 3.3V.

If you look closely at an AGP 4x card, you'll notice that the connector features an extra key-way (or notch) about three-quarters of an inch from the front of the card. This ensures that AGP 4x cards fit only into AGP 4x mobos that support 1.5V. This system is designed to prevent you from damaging your equipment by forcing a non-1.5V/4x card into a mobo that doesn't support the voltage. Some 4x-capable cards will actually fit and run in 3.3V/2x mobos, but will drop down to 2x performance at the higher voltage setting.

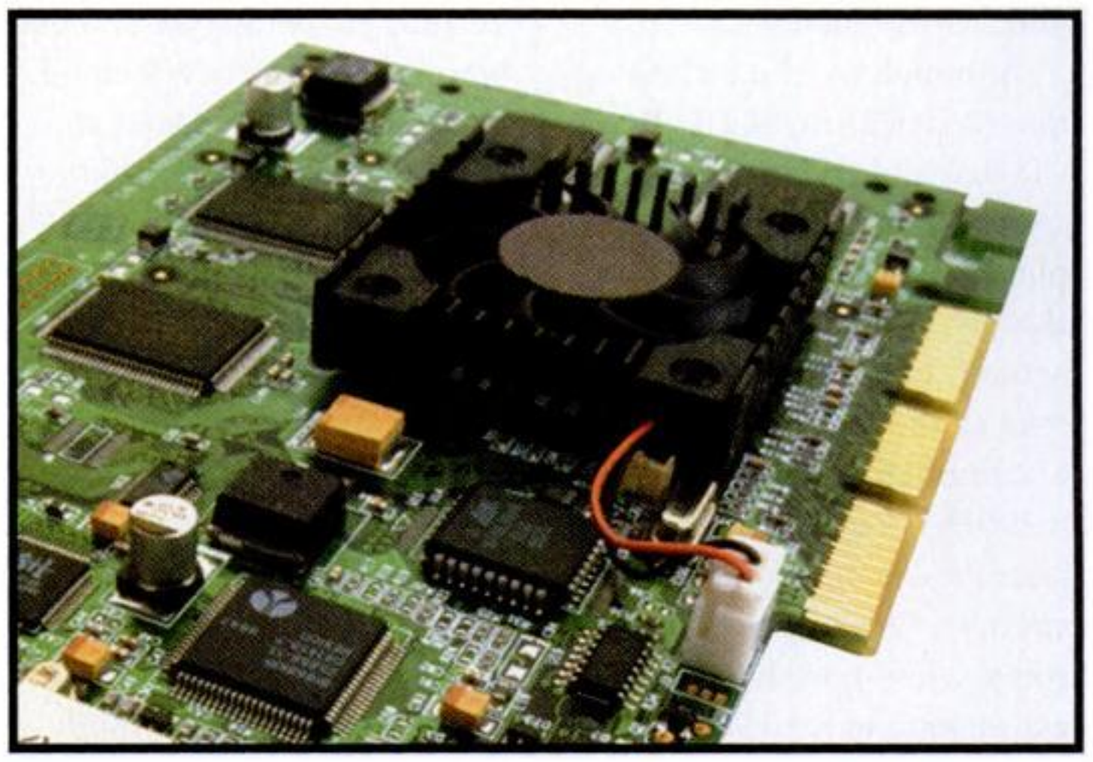
Cards & Chipsets That Support 4x AGP

- Creative Labs Annihilator & Annihilator Pro series (GeForce)
- Creative Labs 3D Blaster Ultra (TNT2)
- Diamond Viper V770 Ultra (TNT2)
- Diamond Viper II (Savage 2000)
- Diamond Stealth S540 (Savage 4)
- Matrox G400 with "4A" in the part number (G400)
- ATI Rage Fury Pro and Maxx series. (Rage 128)
- Guillemot Xentor (TNT2)
- Guillemot 3D Prophet (GeForce)

No Sidebands?

One AGP controversy concerns nVidia's decision to disable sidebanding in its GeForce 256 chipset. Think of sidebanding as a one-way alley that provides a shortcut for AGP access requests. Using an 8-bit sideband address port, requests are sent downstream to the core-logic chipset, maximizing the efficiency of the memory bus. Follow any hardware fan site, and you'll see that nVidia's sidebanding policy has caused a stir in the nVidia community.

The company says it's not trying to pull a fast one on consumers. nVidia disabled sidebanding, company officials told *Maximum PC*, because of the GeForce's support for "fast writes," another advanced form of transfers supported by AGP.



The connector notch on the right fits over a piece of plastic built into the AGP slots of motherboards that only support AGP 4X.

Without fast writes, data must touch the CPU, the core-logic chipset's northbridge, and main system memory before being piped to the videocard. But with fast writes enabled, data can completely avoid main memory, resulting in increased speed. nVidia says because fast writing is a far superior transfer method, enabling sideband would actually hurt performance.

But GeForce owners still want their cards to support sideband, if only because it's a checkbox item trumpeted on the packaging of other videocards. Can the GeForce be an AGP 4x card without sideband-ing? Well, the actual AGP spec calls for videocards to simply transfer data at the rated 2x and 4x speeds. The extra features—fast writes and sideband—are optional. But even nVidia notes that a card supporting 4x transfers without fast writes or sideband would suffer a performance hit.

Troubles In Canada

Matrox is also caught in an AGP imbroglio. Those who purchased early G400 cards may find a surprise when they plug their AGP 4x cards into motherboards with 4x support. Though the first round of G400 cards were sold in boxes that read AGP 4x "compatible," the cards don't support AGP 4x transfers.

Matrox says that the G400 graphics chip supports AGP 4x and sideband, but that the company didn't want to enable AGP 4x before running sufficient quality assurance tests with Intel's Camino core-logic chipset. Only G400 cards with "4A" in the part number support full 4X transfers. With the introduction in November of Camino, Matrox has since enabled full 4x support. Earlier boards will work in 4x mobos, but at 2x data rates.

nVidia and Matrox may ultimately be vindicated. No real-world games or benchmarks have shown significant performance increases from full AGP 4x support. In fact, games won't take full advantage of AGP 4x until they pump more complex polygons and larger texture maps across the bus.

—Gordon Mah Ung

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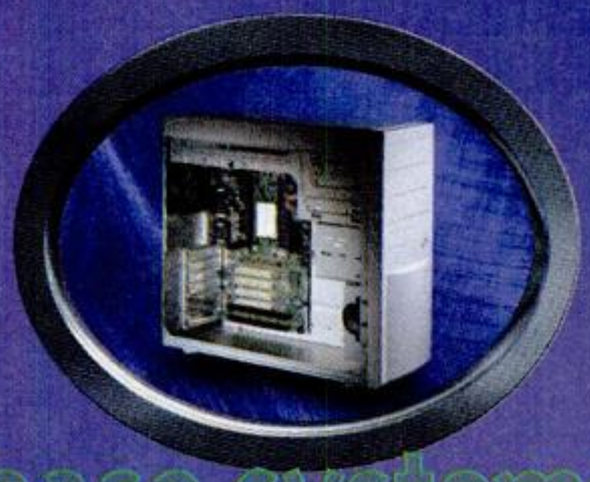

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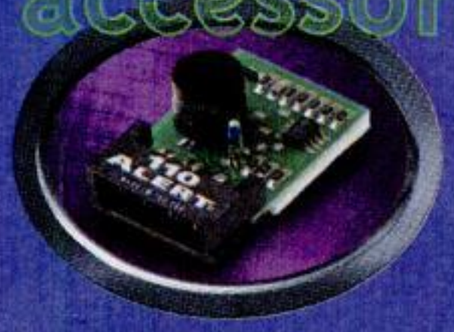

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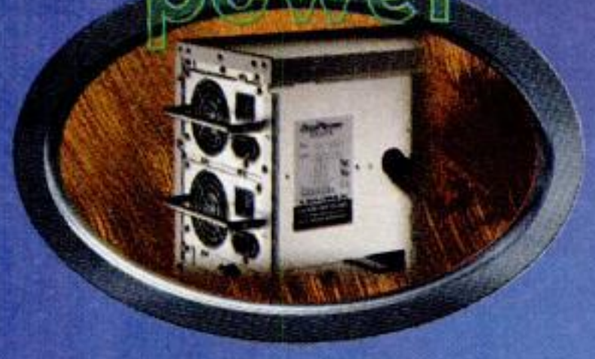

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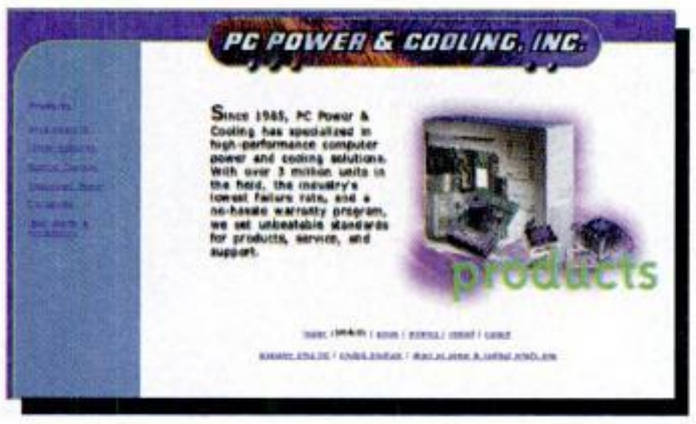

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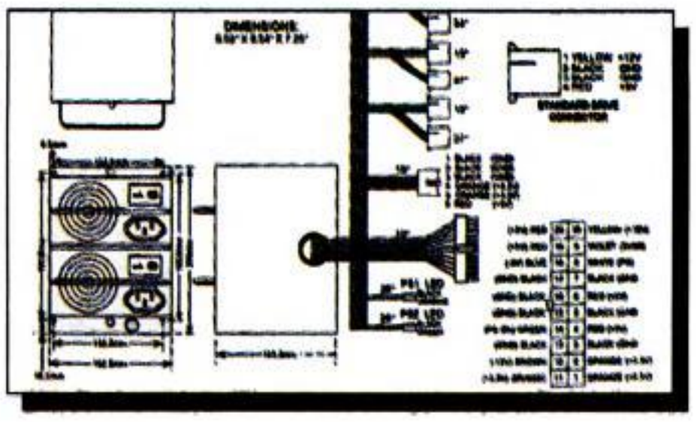

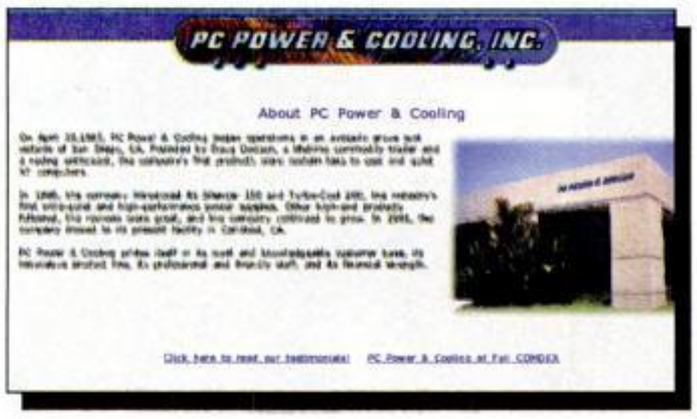

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WATCHDOG

ILLUSTRATION BY SCOTT LAUMANN

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing Watchdog@maximumpc.com. The Dog promises to get to as many letters as possible, but only has four paws to work with.

MSN REBATE RIPOFF

DEAR DOG I purchased a 21-inch ViewSonic monitor for $920, and was planning to apply for the MSN and ViewSonic rebate offer. I called to get the application for the $400 rebate, and to sign up for 36 months of MSN service. I was instead told that Microsoft had temporarily suspended the rebate offer. I asked the customer service representative if Microsoft will reinstate the offer with different terminology, but the person didn't know.

This puts me in a very frustrating situation. If I keep the monitor, I have to pay the full amount. I could return it, but then I will have to pay a 15 percent restocking fee. I feel ripped off by Microsoft, regardless of which choice I make. If Microsoft doesn't get its act together and reinstate the rebate offer, I see a class-action lawsuit in the making!

Do you have any idea if Microsoft will indeed reinstate its rebate offer?

—Neil J Buswell

THE DOG RESPONDS: There are two victims here, Neil: you, and, to some extent, MSN. In early January, someone discovered there was a loophole in MSN's rebate contract, and began spreading the word by e-mail. In 48 states, people who agree to use MSN's network for three years receive a $400 rebate. But in California and Oregon, state consumer protection laws forbid tying sales to loans, in order to protect consumers from shady auto dealers. Herein lies the loophole. MSN mistakenly believed the rebate could be construed as a loan, and tailored its contract for both states. In California, the clause reads, "You are not obligated to continue as an MSN Internet access member for any particular length of time." Of course, once someone finally read the fine print and began notifying friends, it didn't take long for people to line up at stores, sign up for the service, cash in their $400 rebate, then cancel the service the next day.

In January, MSN put the kibosh on the whole deal in Oregon and California while it worked to plug the loopholes. MSN spokesman Tom Pilla says since the rebate program was suspended, the California Department of Corporations has informed Microsoft that its rebate is not a loan, and would not violate the law. "It became clear that perhaps we were being a little conservative," Pilla told **THE DOG**. "And, quite frankly, there was some abuse of the program."

At press time, MSN had not yet reinstated the program in California and Oregon, but Pilla assures The Dog that the program will be resurrected by the time you read this. Pilla also offered to see if Buswell's purchase qualifies for the rebate program. "We certainly apologize to our consumers and retail partners in California and Oregon for any inconvenience that this may have caused, and we thank them for their patience," Pilla says.

PC CONFUSION

DEAR DOG Last August, I was the highest bidder in an online auction for a computer built by an Illinois company called PC Fusion. Because of the 200 positive feedback reports on eBay that the company had, I wired the company $3,250. A few weeks after sending the money, negative postings began to appear on eBay. I still haven't received anything from PC Fusion. I contacted the Illinois State Police, who said they weren't interested in my plight.

— Jay George

THE DOG RESPONDS: Jay was one of the first readers who barked to **THE DOG** about losing thousands of dollars to PC Fusion via an eBay bid. In most of the cases, the victims reported the same MO: They won the auction, paid by check or money order, but got bupkis in return.

PC Fusion has pulled a disappearing act. Its web site is gone, its e-mail bounces back, and its phone numbers are disconnected. Although there was no Internet trail to follow, The Dog picked up a scent by searching public records databases, and tracked down the owner of the company, Mr. Nassir Ali. Unfortunately, Ali refused to return The Dog's numerous phone calls to his home. Family members who answered the phone told The Dog that Ali was "out of the country," or "out for the day."

"I feel ripped off by Microsoft, regardless of which choice I make."

Ali may not be the person behind the PC Fusion debacle, though. Interviews with an ex-employee of PC Fusion indicate that Ali may have indeed been out of the country during the company's problems. The former

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employee told The Dog that Ali left company operations in the care of a supervisor while he was in the Middle East working on a Y2K problem. The company shipped machines until RAM prices spiked this summer, the employee says. When PC Fusion was unable to purchase RAM at prices that it quoted to customers, the supervisor decided to halt sales, which caused a snowball effect.

"Without the income coming in, [PC Fusion] was unable to buy more parts, so people were not receiving their computers," the employee says. The employee is also seeking back pay from the company.

Those who purchased systems but never received them aren't likely to receive the goods (or any refunds) anytime soon. There are no signs that the company actually filed for bankruptcy, but the entire operation seems to have wound down.

PC Fusion's business practices haven't escaped the attention of law enforcement, though. Although the Illinois State Police gave Jay George the cold shoulder, the United States Postal Inspectors office says it's actively investigating the company.

"We're aware of complaints and we're investigating," says Inspector Leo Lalley, a spokesman for the Chicago office of the US postal inspectors.

"PC Fusion's business practices haven't escaped the attention of law enforcement."

Lalley wouldn't divulge the status of the case, but you can expect updates here. He instructed people who lost cash to PC Fusion to contact the USPS. Call 312.983.7901 to request a complaint form. Lalley also recommends that shoppers exercise caution when shopping online.

"I would strongly urge anyone, before they send money to anyone, to do more research on the company or an individual," Lalley says.

Even eBay has implemented extra consumer protection in response to problems similar to the PC Fusion fiasco. Previously, sellers could create profiles without much accountability, but eBay now requires all sellers to provide a valid credit card number before being granted use of the service.

Company officials say the overwhelming majority of transactions are completed without a hitch. Still, horror stories should serve as warnings.

"People have to realize that it's an auction format, and that they're selling and buying with private parties," says Kevin Pursglove, a spokesman for eBay.

Pursglove says victims of outright scams can apply for a claim from eBay, and may be eligible for some slight monetary relief. For those still willing to purchase big-dollar items from auction sites, an escrow service (such as iescrow.com) may be helpful. The person buying an item pays the escrow service, which holds the money until the deal goes through. There is a fee for the service, but the investment may well be worth it for those big-ticket items.

AIMS LAB LOSES AIM

DEAR DOG What's up with Aims Lab? I have a Grabit Pro, but I can't even get to the company's web site to look for updated drivers. I was there just a few weeks ago, and the site was fine.

—Carl Raeside

THE DOG RESPONDS: Aims Labs, probably best known for its video still capture devices, is no more. The company filed for Chapter 7 liquidation in the Northern District of California Bankruptcy Court. Aims Labs left this world with about $500,000 in assets, and between $1 and $10 million in debts. Aims also left behind some 4,500 creditors, mostly people who purchased Aims Lab equipment with a rebate. Unlike many other companies that

Grabit Pro

have folded, Aims Labs has actually instructed people who are due rebates to file claims with the court.

THE DOG received no word from the trustee overseeing the dissolution of the company as to whether anyone has expressed interest in picking up Aims Lab's support and product line. Most of Aims Lab's assets were tied up in excess inventory. With no hope of further driver support, The Dog recommends that even budget shoppers skip the chance to buy Aims leftovers. Instead, check out Play's much better Snappy! product line, which offers customer support and a better rating from *Maximum PC*.

DOG BITES

BIGGER.NET RESURFACES

In January 1999, **THE DOG** dished dirt on failed ISP Bigger.Net, which promised Internet access for life at the low, low price of $59.95. The end of the story was something we've seen way too often: Bigger.Net filed for bankruptcy almost as quickly as it opened.

But the story didn't end there. Washington state ISP Brigadoon later purchased Bigger.Net, and perpetuated the promise of free service. Brigadoon was soon on the rocks as well, and the company found itself in Chapter 11.

But now, after months of restructuring, Brigadoon has returned with something of a happy ending. The company, now recast as Fanz.Net, is once again offering free net access to people.

Gary Moore, Fanz.Net's Vice President of Marketing, tells The Dog that the company is nearly out of bankruptcy, and is inviting former Bigger.Net customers to climb aboard for free. Check it out at Bigger.Net.

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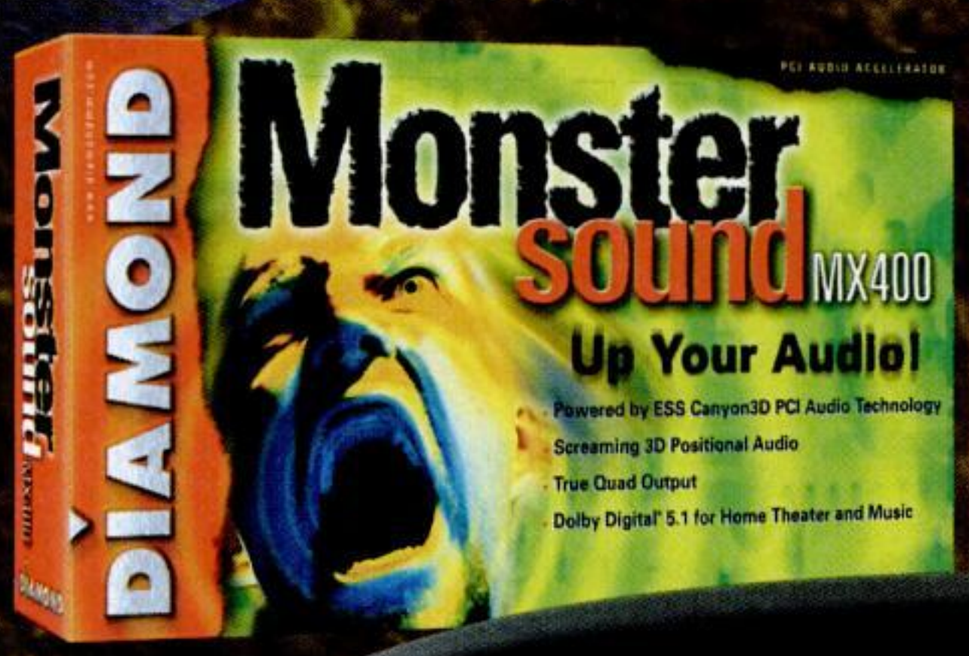

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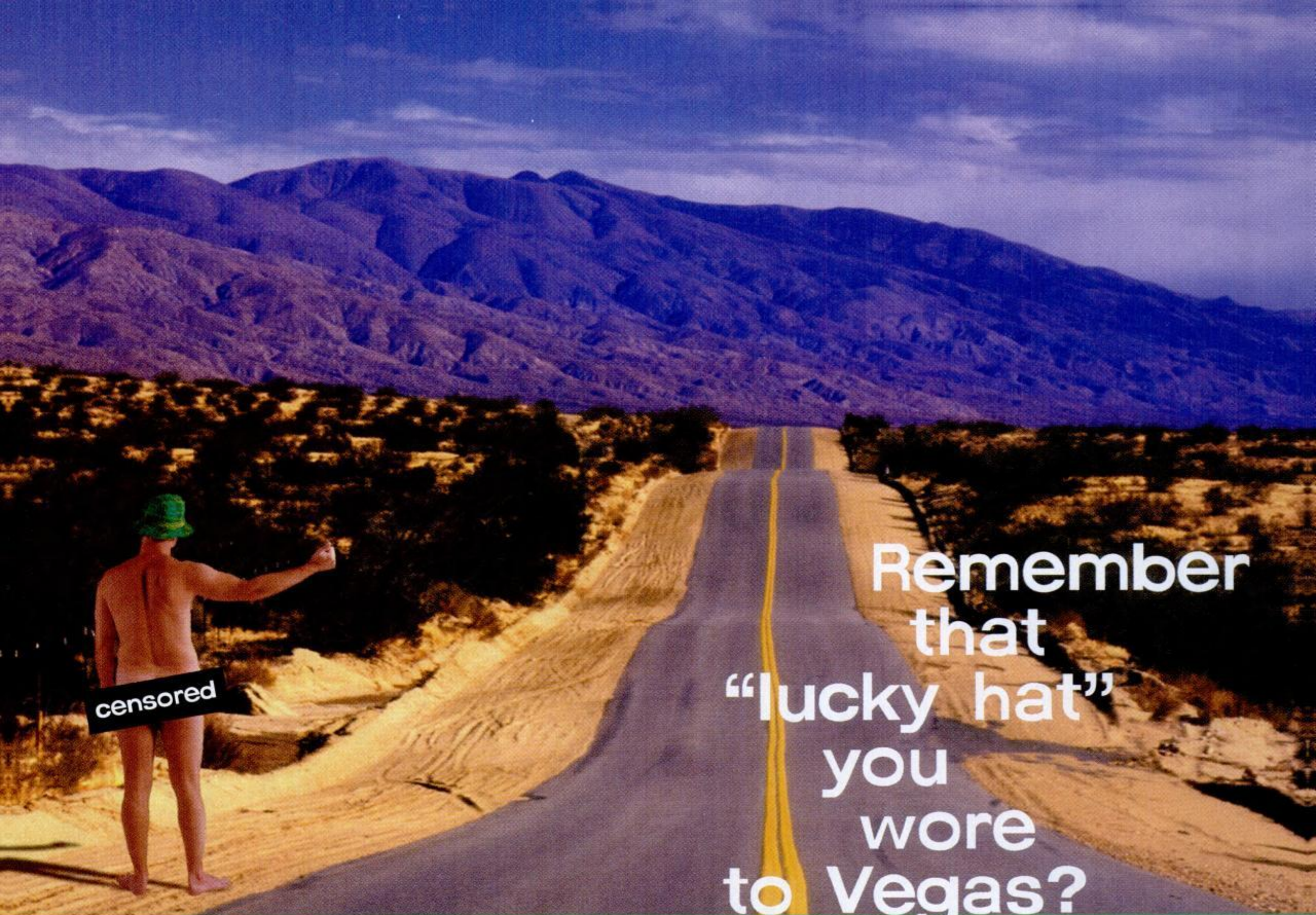

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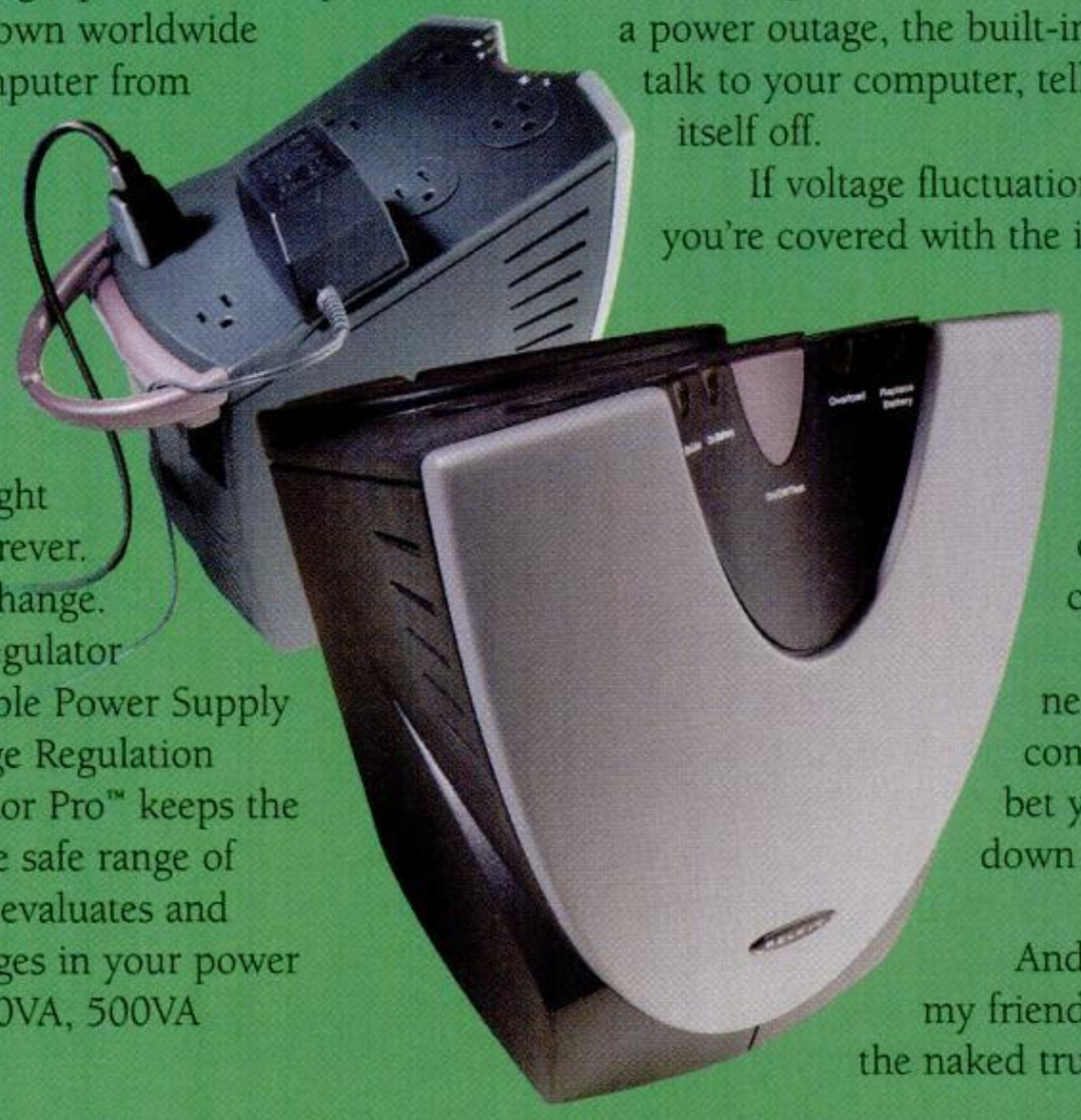

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PERIPHERAL VISION

Avatar Home Theater PC

Designed with the enthusiast in mind, the VBOX features a 400MHz Intel Celeron processor; Windows 98; an arcade game emulator and joystick port; a Dolby Pro Logic audio decoder for rich, enhanced sound; and more ports for peripherals than we knew what to do with. All right, you caught us—at the end of the day, the VBOX is a standard home PC. But with such features as an S-video connection for hookup to your television, an MP3 player, and AC-3 support for 5.1 surround sound with the included speakers, it screams to be used by the media enthusiast. The tiny wireless keyboard/mouse combo takes a little getting used to, but with special multimedia command buttons, you'll be banging out e-mail and surfing the net one-handed in no time, all from the comfort of your Barcalounger. **$760; Avatar Technology Inc; www.v4me.com; 888.467.8269**

Altec Lansing VoicePod

What? Use your PC's microphone, soundcard, and speakers to record a .WAV file and insert it into a document? Darling, how passé. Altec Lansing's (somewhat) nouveau VoicePod takes care of the whole process. Using tape recorder-like controls, VoicePod makes quick work of recording a .WAV file, then embedding it in an e-mail or attaching it to a document. Simply hit the record button and click the volume control—VoicePod's software takes care of inserting the clip into the open application. It also features such niceties as voice cancellation, so it's possible to record a message over the noisy sounds of your decidedly less cultured office mates. Two speakers are embedded in the unit, so you can review the dulcet tones you've just recorded, or use the headphone jack to review them privately, if you so desire. And if nothing else, the VoicePod looks faaaaabulous sitting on your desk. Nothing says "I've arrived" like a gadget that does something you're already capable of doing, but don't want to.
$99; Altec Lansing; www.altecmm.com; 800.258.3288

Corex CardScan Executive

Nothing has made Gordon Mah Ung more effusive in the past month than the CardScan Executive, and when Gordon goes ga-ga for something, we pay attention. Last time, it meant everyone in the office ate some sort of gelatinous snack that made us want to gag. This time, Gordon's got something. In just a few minutes, CardScan 500 scans 100 business cards, then recognizes and sorts your contact information. If the optical character recognition fails—which it rarely does—you can simply refer to the optical image of the business card. The Rolodex-like interface synchs to Palm and Windows CE devices. CardScan 500 features USB and parallel port interfaces. And it tastes better than the gelatin stuff.
$299; Corex Technologies; www.corex.com; 800.942-6739

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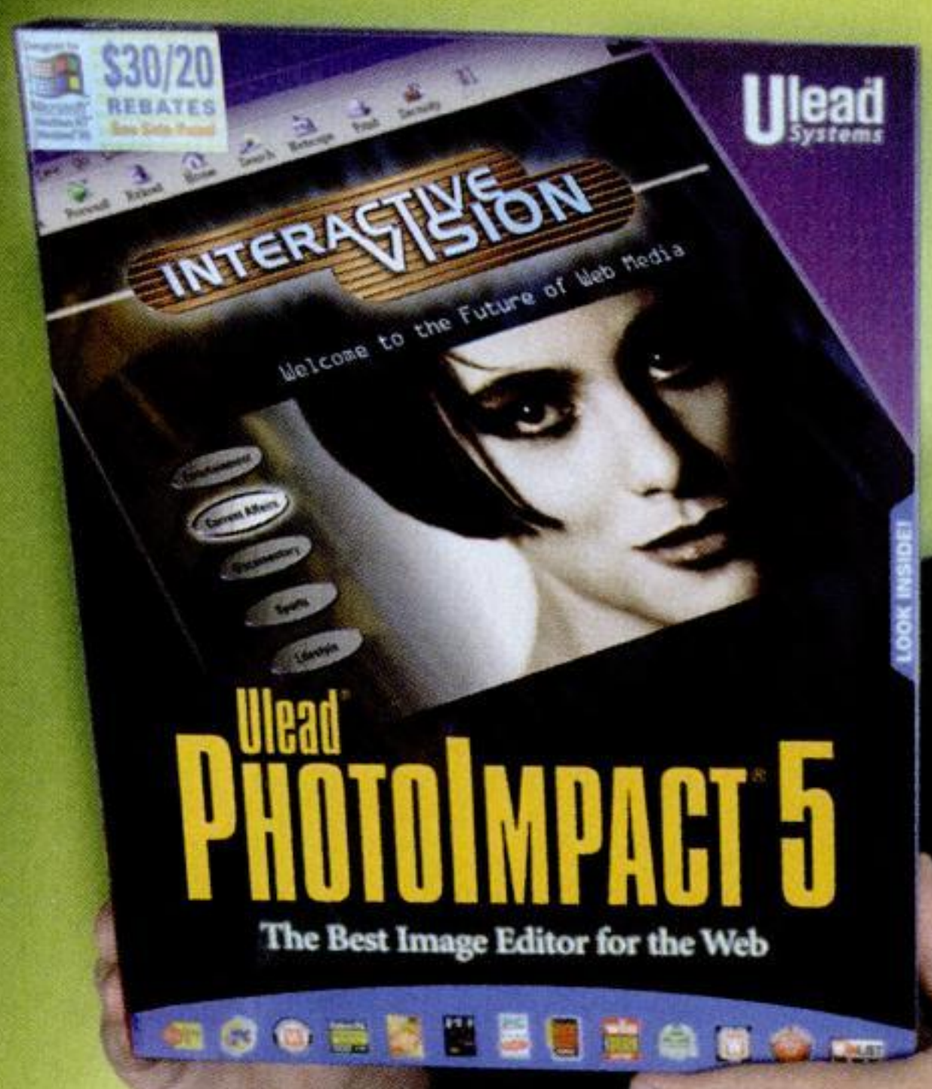

I finally found it. After struggling with other image editors that made designing Web graphics a long and tedious process, I found one that makes it an easy, painless experience. And unlike those other programs, PhotoImpact was the first image editor designed specifically for the Web. It lets me:

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▶TOMORROW'S TECHNOLOGIES EXPLAINED

FAST FORWARD

How Linux Could Fail

THREE OBSTACLES ARE STALLING ITS DESKTOP SUCCESS

Not since the boomlet days of OS/2 Warp have PC buyers been asked to choose an operating system as well as a computer. For nearly a decade, Windows has been the automatic choice for what were once called "IBM-compatible" PCs. Indeed, Windows is so ubiquitous, PCs are known today as "Wintel" boxes (in reference to the dominance of Windows and Intel), and a federal court recently declared that Microsoft is a monopoly.

But now the stars are moving in a different direction, and Linux, the feisty open-source upstart, is steadily gaining ground. Witness: Intel is investing money in Linux distributors, in both the U.S. and Europe. System vendors are offering Linux as an optional or standard feature. Corel just released a new Linux package, and is porting all its productivity software to the OS. Some Linux companies are even going public, attracting the crucial attention of the business community. The momentum is undeniable.

So far, though, Linux has been a bigger hit on servers than on desktop PCs. To break into the mainstream, Linux must find its way onto more PCs of average users. Is that likely to happen?

Linux tree-huggers shout "Yes!" That attitude is nothing new, of course; Mac bigots have proclaimed the superiority of their operating system for 16 years. There are even lunatic fringe elements who champion BeOS or NextStep. None of this noise has stirred the herds of sheep-like Windoze users. (There, I've insulted everybody in one paragraph, so lay off the hate mail.)

During the federal antitrust trial, even Microsoft acknowledged the rise of Linux, arguing that Windows doesn't have a real monopoly. But Linux still faces three major obstacles to mainstream success, and Microsoft is directly to blame for only one of them.

The first obstacle is Linux's ancestry: It's patterned after Unix. Of course, that's one of Linux's greatest strengths, because Unix is a rock-solid, dependable, well-understood operating system. Unfortunately, Linux also inherits the complexity of Unix. Maybe it's a coincidence, but I've never met a Linux user who didn't have previous experience with Unix, usually at a university.

To break into the mainstream, Linux must find its way onto more PCs of average users. Is that likely to happen?

For Linux to succeed as a popular alternative to Windows, it must do a better job of hiding its complexity without sacrificing its other good features. Windows isn't much better, but being just as bad as Windows isn't good enough. Corel's Linux package is a big step in the right direction.

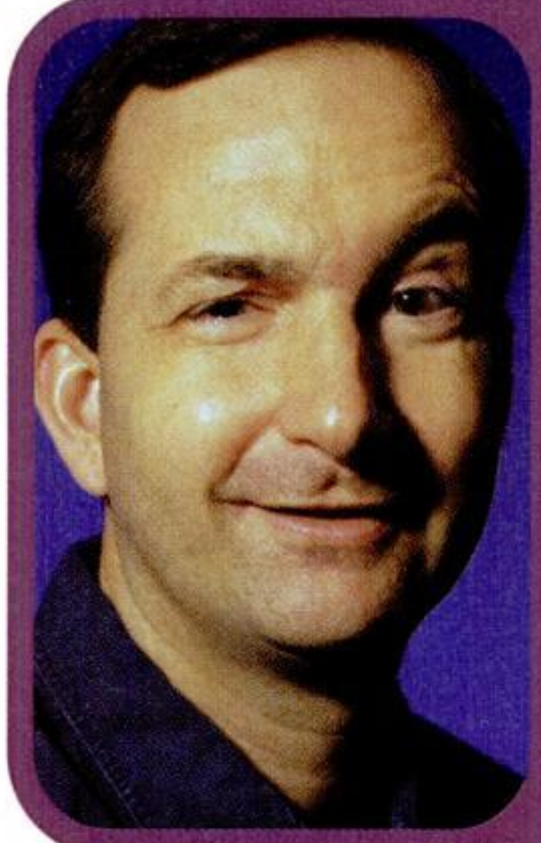
Linux's second obstacle is its lack of a standard graphical user interface (GUI) and application programming interface (API). There are two main contenders: GNOME (GNU Network Object Model Environment) and KDE (K Desktop Environment). Coping with the differences between different versions of Windows is annoying, but at least their APIs are largely the same. Dividing the much smaller Linux community between GNOME and KDE and their underlying APIs creates more problems for non-technical users and wary software developers.

The third major obstacle for Linux is the relatively limited selection of desktop software. There is some very good software for Linux, but there are critical gaps—in particular, games and Microsoft *Office*.

Games are important because the people who play them tend to buy more powerful PCs and more software, so they are influential customers. Many people choose a Wintel PC over a Macintosh primarily because more games are available for Wintel. Linux can't afford to be an also-ran in this category.

Microsoft Office isn't necessarily the best productivity package, but it's the standard at 9 out of 10 corporations. And that, in turn, leads many people to run Office on their home PCs. Even the Mac has Office. Unfortunately, I don't foresee Microsoft porting Office to Linux without a government mandate or a court-ordered breakup that turns the operating system and application software divisions into separate companies.

Keep an eye on Linux, but don't switch off your hype filter. When you hear something new about Linux, ask yourself if it helps the platform overcome those three obstacles to mainstream success. Linux could be the next Windows, but it could also be the next OS/2 Warp. ✹



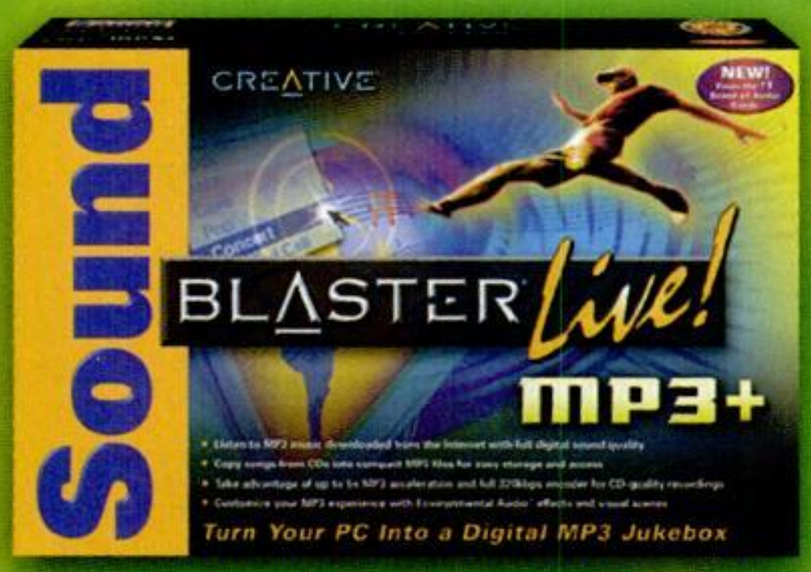
TOM HALFHILL
was senior editor at Byte magazine and is regarded as one of the most knowledgeable experts on processor technology in the industry. Contact him at **thalfhill@maximumpc.com.**

Random Thoughts

▶ After three years of construction, AMD is finally getting its latest fab (chip factory) up and running. Built in Dresden, Germany, Fab 30 cost $1.9 billion and is manufacturing Athlon processors using technology licensed from Motorola. AMD predicts Athlon will run at 1GHz (1000MHz) by the end of this year.

▶ Remember a few years ago when Microsoft ridiculed the concept of network computers? At Fall Comdex, Microsoft demonstrated low-priced "Internet companions" that run nothing but a web browser, and depend on network connectivity. I hate to say "I told you so," but...

▶ Next-generation USB interfaces will run 30 to 40 times faster than today's USB—about 45 to 60MB per second. That's as fast as IEEE 1394 (a.k.a., FireWire). The first USB 2.0 products are expected later this year.



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▶ GETTING MORE FROM YOUR TIME ONLINE

NET SENSEI

Store It Online!

END MAIL BOMBING BY SHARING VIRTUAL HARD DRIVES

As a designer, I used to constantly send people 20MB mail bombs of high-res graphics. I didn't want to; it was my job. It was either sacrifice my bandwidth for hours on end, or figure out which media, and which platform, and which version of which software each of us had in common, and then use snail mail to send a disk from here to there. E-mail was much quicker, but a pain if the person on the receiving end wasn't expecting the bomb when she hit "Get Message." Try sucking 20MB down a 33Kbps pipe.

File-swapping has since been revolutionized by an explosion of online storage and file-transfer services; register, and you can receive multi-megabytes of storage and swapping rights. The beauty in using the net is that your files become totally portable: What goes up can come down anywhere you want it to. Plus, you don't need to understand FTP to use these services; file transfer works through your browser over HTTP. And did I mention that these services are free?

If all you want to do is upload a file for someone else to download, go with a simple file transfer service (think "waaay temporary storage"). Good ones to scope include WhaleMail (**www.whalemail.com**) and Click2Send (**www.click2send.com**), both of which let you transfer up to 50MB at a time.

After registering (spam-haters should uncheck the "special offers" box), use the simple interface to locate the appropriate file on your local drive, enter the e-mail address of the person who needs to receive the file, and click "send." Fifi's photo will automatically be uploaded to the service's server, and Grandma will receive an e-mail that tells her where the file is located. These services only store your data for about a week, so don't use them for permanent storage (and don't delete the originals from your hard drive).

For cleaning up your local drive, get yourself an online storage site (think "hard drive in the sky"). Two of the most innovative are Driveway (**www.driveway.com**) and i-drive (**www.idrive.com**). Driveway offers 30MB of storage, but will grant you more space if you answer marketing surveys, or sell out your friends. The site interface is similar to a Windows hard drive folder, boasting the same kind of directory structure. In addition to using Driveway to upload and download files, you can grant others access to specific folders via e-mail and a password, much like the file transfer sites. Driveway's "Park It" feature allows direct saves from another web site. Say you're at a friend's house when you finally find that pirated version of *The Blair Witch Project* you've been looking for. Save it to your Driveway account (without ever tapping your friend's local drive), and download it at home. You can also directly save to Driveway from Microsoft *Office 2000* applications.

File-swapping has been revolutionized by an explosion of online storage services.

More of a community than a personal hard drive, i-drive can be a personal homepage/hard drive combo if you choose. Folders can be made private, or shared with "friends" (that is, other i-drive members). Other free nifties include Filo, which allows you to save entire web pages, and Sync, which compares the files on your computer to those in cyberspace and sends the most recent documents to their proper place.

So, what are the drawbacks of all this storage goodness? Expect advertising on start screens, though most services don't inundate you with ads once you enter "your space." And any personal information you provide during registration or in surveys may be sold for marketing research purposes (though this kind of data is generally gathered and shared quantitatively, and rarely points prying fingers back at you). If you're concerned about unwanted e-mail, or personal info being distributed, carefully read all licensing agreements before clicking "I agree." Some other tips include:

Keep it active. Nearly all free online storage services consider accounts "abandoned" after a period of time, and delete them. Usually, it takes about six months, but I wouldn't push it.

Keep it safe. If your data is sensitive, make sure the service you choose uses a strong form of encryption. Look for 128-bit, or services advertising that they use the same methods that banks use.

Keep it legal. Copyright infringement is no laughing matter. None of these services endorse illegal MP3, image, or video activity. If you get caught, it's your fault.

Sometimes, 50MB isn't 50MB. Some sites claim to give a certain amount of free space, but it's really a lot less. Using their compression methods, you may or may not be able to store the amount of data they advertise.

Know your options. Visit **www.emailaddresses.com/email_storage.htm** for a linkolicious offering of free online storage sites.

SHERRY MONARKO has used the Internet for everything from ordering pizza to getting married. She is Lead Online Designer for Imagine Media's Computers & Technology Division. Contact her at **smonarko@maximumpc.com.**

Random Thoughts

▶ Repeatedly clicking the same broken link won't make it work.

▶ Moving your pointer around in circles won't make a page load faster.

▶ Using the boolean "not sex" during a search does not decrease the number of porn sites returned.

▶ Java does not in fact have any known cooties.

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▶THE SCOOP FROM A MAJOR PLAYER

GAME THEORY

Slow Down, Enjoy the Adventure

ARE NARRATIVE ADVENTURE GAMES MAKING A COMEBACK?

The subject at hand, precipitated by *Gabriel Knight 3*, is the adventure game and its purported demise. In a dismissive review of *GK3*, *PC Gamer* UK pronounced the adventure game dead.

Hurting? Yes. Dead? No. No genre is ever dead. They all come and go in cycles. Today's flava will be at the bottom of a wire bin at Walmart tomorrow. Even the text parser made a brief comeback in *Starship Titanic*. But there's no questioning that the narrative, puzzle-driven adventure game is in a very deep lull, and the fault lies evenly with both developers and gamers.

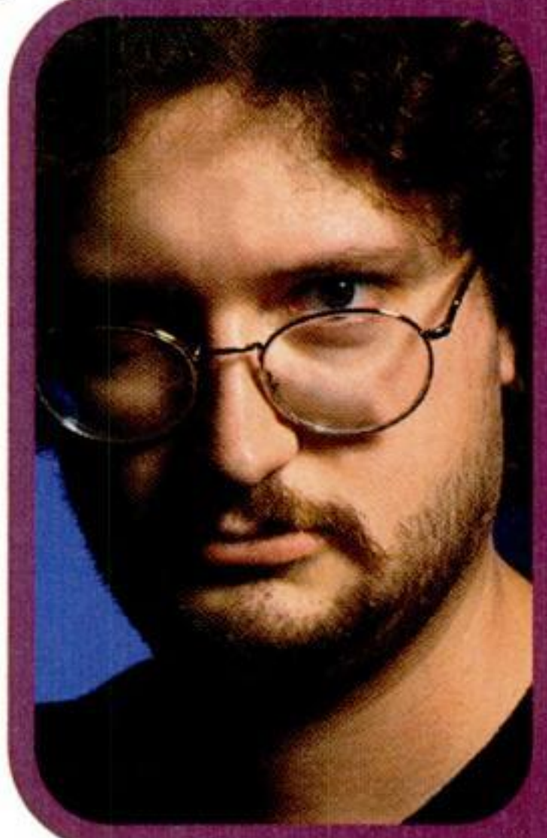
Once again, you folks bewilder me. (Not *you* of course: I'm talking about some other reader.) When FMV was the flava, consumers couldn't get enough of modestly paced narrative games filled with obtuse puzzles and bad video. Pulling levers in *Myst*? This appealed to about four million of you. When lab rats do this, they at least get a piece of cheese. FMV went away and 3D accelerator-driven 3D action games took over. Now, everything has to be fast-fast-fast. You move through *Arena* so fast, who cares about the damn bezier curves? Story? Character? Id openly scoffs at the mere thought. It's a frenetic pace for a hyperactive society with the attention span of my toddler. You can't even be bothered to play a true masterpiece like *Grim Fandango*. A funny, beautiful work of gaming art, *Grim Fandango* simply croaked at retail, and its failure helped consign the traditional adventure game to the back burners of almost every game publisher.

This failure can only partly be blamed on the ascension of action gaming. The other part goes to the taint that the genre gave itself: that kind of namby-pamby, pun-heavy crap identified with the ghastly *King's Quest* and other Sierra series. Only the *Gabriel Knight* games among Sierra's adventures really has teeth. Having played *GK3*, I think I understand why adventure games are hurting. Coming upon its deep story, thinking puzzles, and leisurely novelistic pace on the heels of a few months of heavy action gaming caught me short. I had to come at *GK3* four or five times before I felt patient enough to readjust and slow down. Was I rewarded for this effort? I think so. Though the game lacked the humor of the best Lucas games, it told a good story and provided an interesting challenge—something action games don't often do (*Wheel of Time* being a notable current exception).

You can't even be bothered to play a true masterpiece like Grim Fandango.

Sierra On-Line co-founder Roberta Williams, who is partly responsible for killing adventure games, has another idea. In a meandering interview at Gamers Depot, she offered such pearls as: "Back when I got started … the demographics of people who were into computer games was totally different, in my opinion, than they are today. Back then, computers were more expensive, which made them more exclusive to people who were maybe at a certain income level, or education level. They probably didn't watch television as much, and the instant gratification era hadn't quite grown the way it has lately.

I think in the last five or six years, the demographics have really changed because computers are less expensive so more people can afford them. More 'average' people now feel they should own one."



T. LIAM MCDONALD is a veteran gamer and game writer. His reviews appear regularly in *PC Gamer* and other publications. Write him at **tmcdonald@maximumpc.com.**

"Average people"? "Certain income level or education level"? So, adventure games aren't popular because the middle class got involved? Blue collar slobs don't like to think as much? Or has the taint of elitism sullied the experience? Just how clever do you think lame offerings like *To Heir is Human* were, Roberta? Maybe it's that very self-satisfaction that produced the line of miserable trash that helped ruin adventure games.

Sure, we were lured away by faster pacing and better graphics, but the adventure game devolved into such obsequiousness that it barely merited our attention.

The problem came when this taint affected good adventure games like *Grim Fandango* and *Blackstone Chronicles*. The genre doesn't need to be in this lull, but under the two-pronged assault of bad adventure games and good 3D action games, it was simply shoved aside. *Gabriel Knight 3*, despite a horrendous voice performance by Tim Curry, restores some luster to the traditional narrative adventure. Whether it's a fluke or the beginning of an adventure revival will be decided, as such things always are, not by elitist theories, but by economics. ✹

Random Thoughts

▶ *Quake III* v. *Unreal Tournament*: Yeah, I'm tired of the subject too, but I figured I'd add my voice to the chorus of contempt for the lackluster gameplay of *Q3*, id's first real hummer. *UT* is so much better than *Arena* that it's scary, but both come in second to *Tribes*, which is dying out there for some bizarre reason. If you want to be stuck with bland games like *Arena*, then by all means, go on ignoring under-hyped titles like this.

▶ *Zillions*: You probably don't know a thing about this game, since it's a zero-bandwidth compilation of 300 board games for solo and internet play. However, *Zillions* is based upon a rich custom rules language that enables anyone with rudimentary HTML skills to code their own boards and game rules. It's really a sharp little title, particularly for laptops. Check it out at **www.zillions-of-games.com**.

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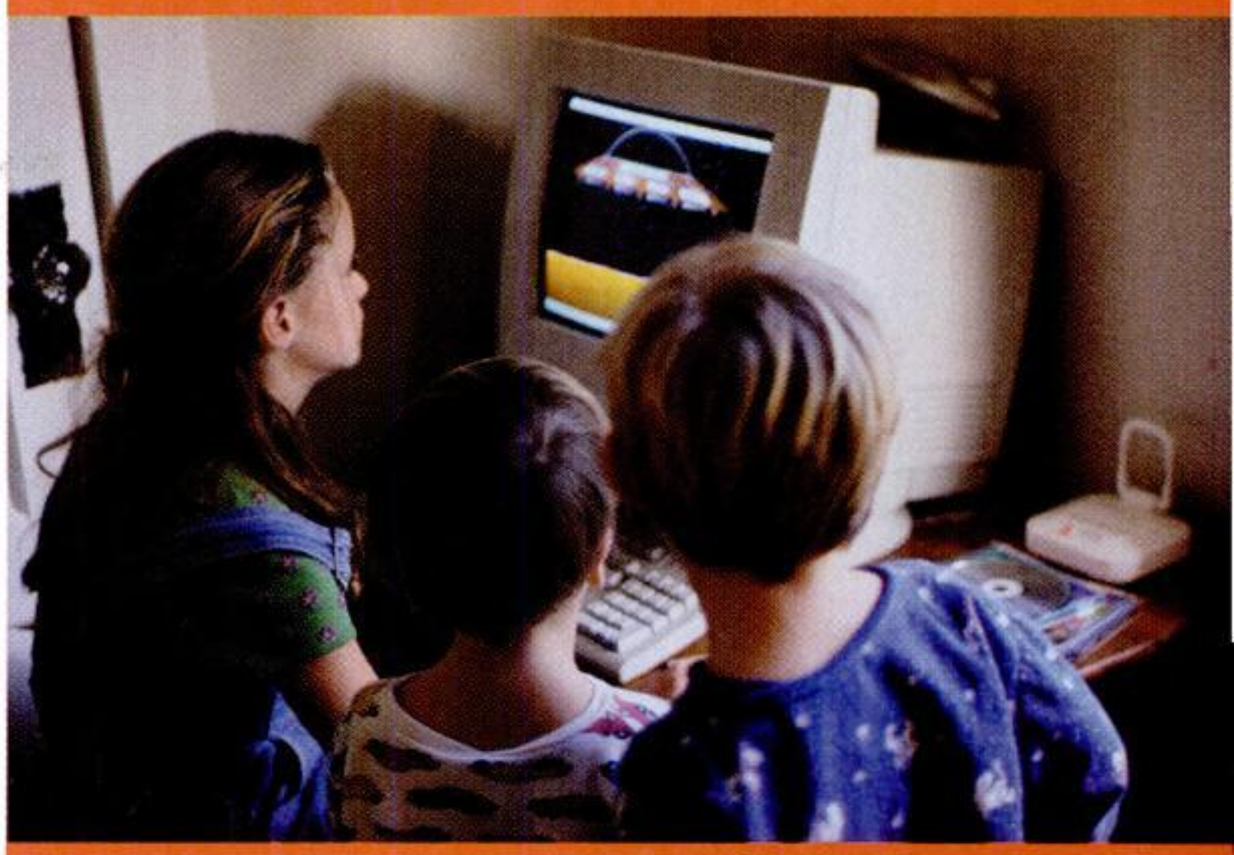

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HOW MUCH IS THAT

by Gordon Mah Ung and Josh Norem

PC in the WINDOW?

Cheap PCs sure are cute. But if you take one home, will it pee on the carpet and break your heart? We review and upgrade six sub-$1,500 systems.

Like buying a cute puppy, buying a cheap PC can quickly lead to nightmares. Take that little feller home, and you might discover it limps when running your favorite software, or defies upgrading when you need to add a new part. But not all cheap PCs resist training. In fact, some might be the perfect platforms on which to build mean-and-lean, personalized, kick-ass systems.

We called six national vendors, and asked them to send us the best PCs they could sell for $1,500. Once the frisky puppies arrived in The Lab, we set out to answer the three most common questions people have about cheap PCs: 1) Are they any good?, 2) Can they be upgraded and overclocked?, and 3) How do they compare to the big dogs that cost twice as much? After we benchmarked all the systems, we popped the hoods and tried to overclock the snot out of 'em. In the following reviews, we report on our overclocking success, detail possible CPU upgrades and general expansion opportunities, and describe what we'd add to each system for another $500. Feel free to use this information when upgrading your own machine at home. After all, if you built a kick-ass system six months ago, it might be very similar to the cheap PCs of today.

To put everything in perspective, we compared the scores of the eMachine (page 40) against our "zero-point" 500MHz reference system (page 75), and an 800MHz Dell (page 76). We then upgraded a really cheap PC—a $600 Celeron 400 box—component by component to determine the hard benefits of upgrading.

We have to note that none of these cheap PCs deserves a Kick Ass award—the little pups just don't have state-of-the-art power. But almost all of them are overclockable out of the box, surprisingly upgrade-friendly, and relatively tweakable for hobbyists and power mongers alike.

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eMACHINES eMONSTER 500A

THE WORLD'S BEST WHAT?

When we brought the eMachine into The Lab, it was like the homecoming of a bouncing baby boy. "Awww, it's so cute!," squealed one editor. "It's so small!," said another. But after spending a few weeks with the tyke, we found a few surprises lurking under the eMachine's cloyingly precious hood.

It should be noted that eMachines aren't configurable, so when we asked for the best eMachine available for $1,500, the company sent us its top-of-the-line, $900 eMonster 500. A sticker on the case boldly states that the eMonster is the "world's best gaming machine," which it most certainly is not. But even though its ATI Expert 128 card is outdated, the box cranked out very playable frame rates during testing. The eMonster even ran 800x600 *Quake III* at almost playable frame rates in our unofficial, after-hours testing. And hey, it's got an AGP slot, so you can always upgrade to finer silicon.

Our main gripe with the eMonster is its slow application performance—it couldn't beat any of the other machines in a single benchmark category. The eMachine is seriously hampered by its wimpy 64MB of SDRAM and ancient ZX chipset. Surprisingly, its flea-market Trigem hard drive posted impressive HD Tach scores, coming in second only to the Micron's ATA/66 IBM Deskstar.

The eMonster could only be considered the world's best game machine if your game of choice is Barbie Fashion Designer.

EASILY OVERCLOCKED?
Forget about it. No access to bus speeds in BIOS!

CPU UPGRADES
Allowed up to P-III 550; rejected all faster procs

SLOT MAP

AGP	ATI Expert 128
PCI	V.90 modem
PCI	Free
PCI/ISA	Free

UNDER THE HOOD

THE BRAINS	
CPU	Pentium III 500MHz
L2 Cache	512K closely coupled, half core speed
RAM	64MB PC100 SDRAM (256MB max)
Mobo	Trigem NP77ZX (ZX100 chipset)
Drive Bays	Two 5.25-inch (one free), one 3.25-inch
I/O Ports	Two USB, two serial, one parallel, gameport
DISPLAY	
Video	ATI Expert 128
Monitor	15-inch (0.28mm dot pitch)
Refresh@ Max Res	60Hz@1024x768
STORAGE	
Hard Drive	13GB Trigem SV1363D (ATA/66, 5400rpm)
CD/DVD	8x Samsung DVD-ROM SD-608
Removable	Floppy
Fax/Modem	56K V.90
SOUND	
Sound	Crystal Semiconductor CS4280 (on-board)
Speakers	No-Name P.O.S.
THE BUNDLE	
Sun Microsystems *Star Office* 5.1 I AOL I Compuserve	

BOOT 1:11 DOWN 0:05

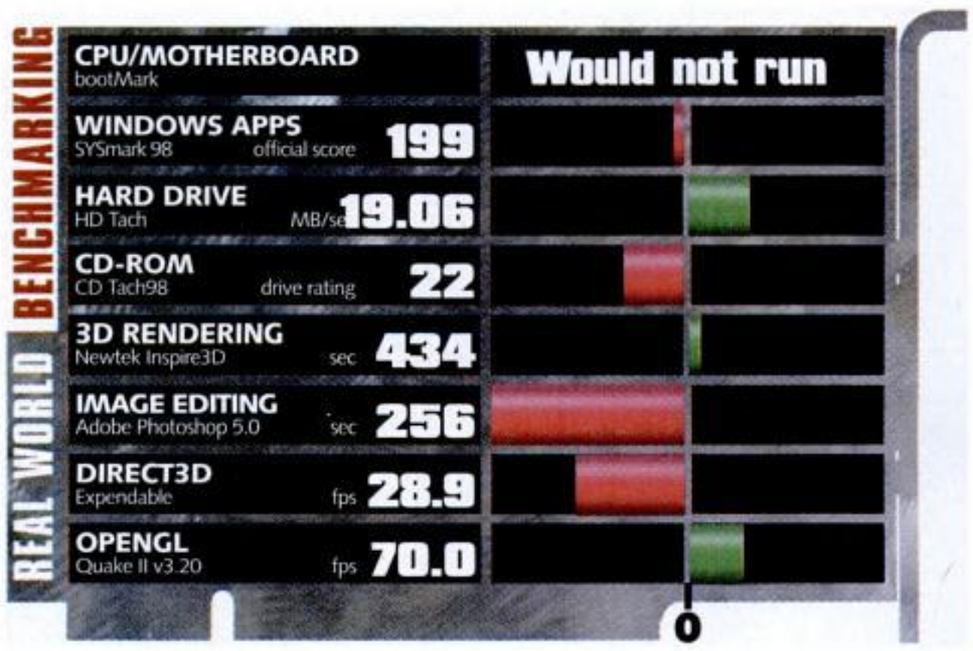
Upgradability

The eMonster's biggest weakness is its Trigem mobo, which only supports a 5.5 multiplier. eMachines told us the eMonster would run processors up to 800MHz, but lab testing showed it couldn't handle anything higher than a P-III 550. You can add more memory to the one free DIMM slot, cranking the memory up to 192MB with just one 128MB DIMM, and the roomy case and neat wiring will let you do so with ease. The eMonster includes an 8x DVD-ROM drive, and the ATI Expert 128 provides excellent image quality. The speakers are a joke, though; they resemble salt and pepper shakers with cones.

Testing the eMonster was hardly a walk in the park. On several occasions, the ATI DVD software spewed flying green boxes all over the screen, forcing us to stop "testing" DVDs and return to work. Rebooting several times solved the dilemma, but we felt the boxes were a sign of dubious software.

What we'd add for $500

The first thing we'd do is ditch the 15-inch monitor. We'd spend $175 on a 17-incher, and pick up a Diamond Viper V770 Ultra videocard for $150, to play *Quake III* in all its glory. We'd also grab the Cambridge Soundworks PC Works speakers for $50, a 64MB DIMM for $75, and a Diamond MX300 soundcard for $50.



MAXIMUM PC VERDICT

Price $900
Company eMachines
Phone 877.566.3463
URL www.e4me.com

Copyrighted material

Kingdom Pinnacle P-III 500

THE MIDDLE-OF-THE-ROAD PC

Kingdom Computing isn't as established as some of the other companies in this roundup, so we're guessing it operates within tight profit margins that make it difficult to sell awesome PCs for $1,500. The Kingdom PC's parts are modest: a P-III 500 running on a BX chipset, a no-name TNT2 graphics card, a 17-inch monitor, and 128MB of PC100 SDRAM. This config isn't awful, mind you, just right in the middle of the spectrum—barely ahead of the eMachine and Kaypro, but far behind the big dog pack of Micron, Quantex, and Axis Systems.

Six months ago, this box could have passed for our Dell P-III 500 baseline machine, which we use to determine our "zero-points" in system benchmarks. In every test we ran, with the exception of CD Tach, the Kingdom PC scored within a few points of our established zero-point scores. Its most impressive showing was in our Direct 3D *Expendable* benchmark. Its modest TNT2 kicked out 52.4fps, just two frames behind the fastest D3D machine in the round-up, the Voodoo^3-equipped Axis System PC.

Speaking of the videocard, an erroneous sticker reading "32MB TNT2" was affixed to one of its memory chips; when we went into Display Properties, we found the card was actually a 16MB "Vanta" TNT2 card. *Maximum PC* no likee!

The Pinnacle performed much like our zero-point reference system—but that's not good enough for this round-up.

EASILY OVERCLOCKED?

Yes! We obtained 560MHz by taking the system bus to 112MHz via soft jumpers

CPU UPGRADES

Allows P-III Katmais and Coppermines up to 800MHz; mobo supports 8X multiplier

SLOT MAP

AGP	TNT2 card
PCI	Free
PCI	Free
PCI	Free
PCI	V.90 Modem
PCI/ ISA	Soundcard
ISA	Free

UNDER THE HOOD

THE BRAINS

CPU	500MHz Pentium III
L2 Cache	512K closely coupled, half core speed
RAM	128MB PC100 SDRAM (768MB max)
Mobo	Tekram P6BX Rev. 1.02
Drive Bays	Three 5.25-inch (two free), one 3.5-inch I/O Ports: Two USB, two serial, one parallel

DISPLAY

Video	Cardex nVidia TNT2 Vanta (16MB SDRAM)
Monitor	17-inch (0.27 dot pitch)
Refresh@ Max Res	60Hz@1280x1024

STORAGE

Hard Drive	13GB Maxtor Diamondmax (ATA/33, 7200rpm)
CD/DVD	Delta 48x
Removable	Floppy
Fax/Modem	Zoom 56K V.90 PCI fax modem

SOUND

Sound	Yamaha 724 PCI Soundcard
Speakers	Midiland MLI 450 3-piece system

THE BUNDLE

VCD Power Player | Microsoft: Works | Word | Calendar | Money | Reference | Clip Art Gallery | Expedia | Greetings | Picture-it Express 2.0

BOOT 1:11 DOWN 0:05

REAL WORLD BENCHMARKING

CPU/MOTHERBOARD	bootMark	238
WINDOWS APPS	SYSmark 98 official score	205
HARD DRIVE	HD Tach MB/se	15.36
CD-ROM	CD Tach98 drive rating	21.1x
3D RENDERING	Newtek Inspire3D sec	434
IMAGE EDITING	Adobe Photoshop 5.0 sec	131
DIRECT3D	Expendable fps	52.4
OPENGL	Quake II v3.20 fps	48.8

0

Upgradability

Upgrade options are about average: Three open PCI slots, one open ISA slot, and two empty DIMM slots. The case is semi-roomy but nothing special, and is made out of what appears to be solid steel. The motherboard comes with an 8x multiplier, so this puppy can handle processors all the way up to 800MHz. Ironically, upgrading the CPU would be a struggle—the power supply sits directly over the processor!

Upgrading is the only way to make this system even remotely worthy of praise, as every single stock component is strictly middle-of-the-road (more so than any PC in this roundup). After all, the eMachine has a DVD-ROM drive, and the Kaypro has a Sound Blaster Live! Card.

What we'd add for $500

It's hard to pick a weak link in this chain because all the components are so desperately average. Still, we figure the best boost would come from upgrading the processor. For $425, we'd take a 600MHz Pentium III, which would increase application and gaming scores significantly. With the left-over change, we'd take a Sound Blaster Live! Value 3D soundcard for $75. This config came with 128MB of stock memory, so the DIMM upgrade can wait.

MAXIMUM PC VERDICT

Price $1,497
Company Kingdom Computers
Phone 800.385.3437
URL www.kingdomcomputers.com

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Kaypro 6100

BIG MONITOR, SMALL BENCHMARK SCORES

Although the Kaypro didn't perform as poorly as the eMachine, its scores were alarmingly slower than similarly configured machines in the round-up. The kiss of death for the Kaypro is its scant 64MB of PC100 SDRAM, which impacted performance in the 3D rendering and image editing tests. The Kaypro's hard drive—seemingly powered by a hamster—is another weak link. In HD Tach, the 10GB IBM Deskstar hit an average read speed of 10.65MB/sec, which is consistent with the drive's historical performance but significantly slower than scores posted by the other machines. Part of the problem is that the drive is a few generations old, and runs on an ATA/33 interface. We re-ran HD Tach multiple times to confirm the score, but the hamster refused to run faster atop the drive's spinning platters. Lazy hamster!

The Kaypro isn't bad for gaming. Its Sound Blaster Live! Value soundcard—one of our favorites—is the only card in this roundup to feature dual outputs and support for EAX positional audio. The Kaypro also comes with a 19-inch monitor, which was a sight for sore eyes (literally) after staring at the 15- and 17-inchers of the other systems throughout weeks of testing. The system's Matrox Millennium G400 video-card pumps out perfectly acceptable frame rates, and its 2D image quality is superb.

The Kaypro is ripe for upgrading and overclocking tomfoolery, but its stock benchmarks suck.

We should point out that the Kaypro costs only about $100 more than the eMachine, and delivers better performance across the board. It gets spanked by the $1,500 machines, but represents the low end well.

EASILY OVERCLOCKED?

Yes! We achieved 560MHz by increasing the system bus to 112MHz

CPU UPGRADES

Mobo supports P-III Katmais up to 600MHz

SLOT MAP

AGP	Matrox G400 card
PCI	Free
PCI	Free
PCI	SB Live! Value
PCI/ISA	Modem
ISA	Free
ISA	Free

UNDER THE HOOD

THE BRAINS

CPU	500MHz Pentium III
L2 Cache	512K closely coupled, half core speed
RAM	64MB PC100 SDRAM (1GB max)
Mobo	Premio 212 E (BX chipset)
Drive Bays	Three 5.25-inch (two free), four 3.5-inch (two internal, three free)
I/O Ports	Two USB, two serial, one parallel, gameport

DISPLAY

Video	Matrox Millennium G400 32MB SDRAM
Monitor	19-inch (0.26mm dot pitch)
Refresh@ Max Res	75Hz@1600x1200

STORAGE

Hard Drive	10.1GB IBM Deskstar 14GXP (7200rpm, ATA/33)
CD/DVD	Mitsumi 48x FX4820T
Removable	Floppy
Fax/Modem	3Com 56k V.90 PCI modem

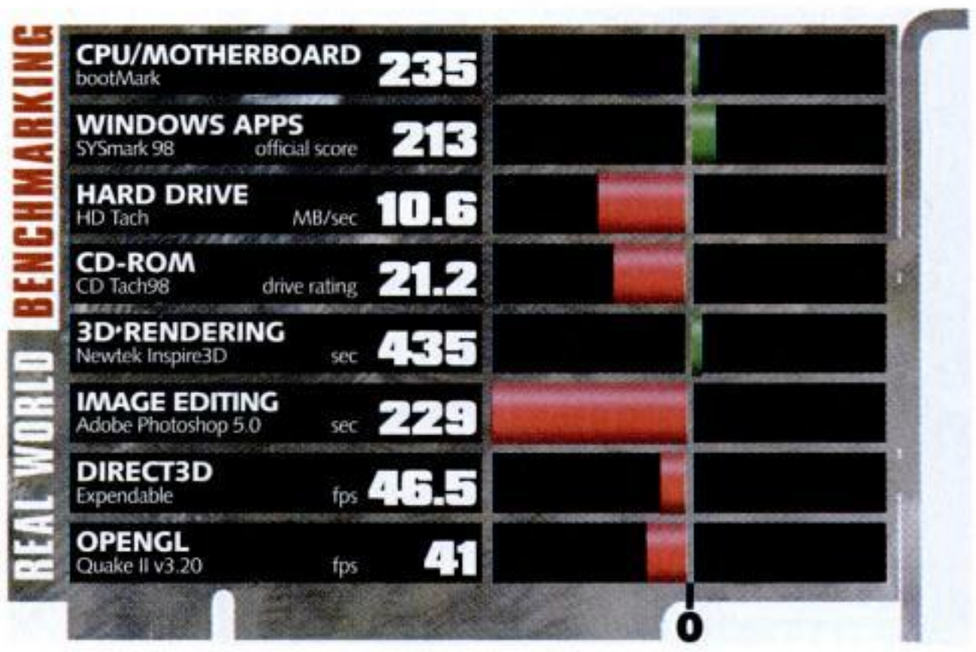
SOUND

Sound	SoundBlaster Live! Value
Speakers	MLI 130 two-piece

THE BUNDLE

Microsoft Clip Gallery | Microsoft Encarta | Microsoft Works | Microsoft Money97 | RingCentral Fax

BOOT 1:10 DOWN 0:07


REAL WORLD BENCHMARKING
CPU/MOTHERBOARD bootMark 235
WINDOWS APPS SYSmark 98 official score 213
HARD DRIVE HD Tach MB/sec 10.6
CD-ROM CD Tach98 drive rating 21.2
3D*RENDERING Newtek Inspire3D sec 435
IMAGE EDITING Adobe Photoshop 5.0 sec 229
DIRECT3D Expendable fps 46.5
OPENGL Quake II v3.20 fps 41
0

Upgradability

The Kaypro's expansive ATX case (the same case used by Falcon Northwest) is ripe for upgrading. Although not as roomy or user-friendly as the Micron case, it's easily the second-best case in this roundup, with seven drive bays, an easy-access side panel, and room for cooling options.

The motherboard supports Katmai P-III CPUs up to 600MHz, and Kaypro tells us the 6100 model now comes stock with a 600MHz CPU. The company also says all of its future PCs will support Coppermine processors, and by the time you read this, the 6100 may very well ship with a 600MHz Coppermine.

What we'd add for $500

Adding 128MB of PC100 SDRAM would set us back $150, but we'd crank the total up to 192MB, and turn this rig into a whole new PC. For another $200, we'd throw in an $80 ATA/66 controller from Promise Technologies, and a 13.6GB IBM Deskstar 34GXP ATA/66 hard drive. With the $70 leftover, we'd spring for a set of Cambridge Soundworks four-point surround speakers to take advantage of the soundcard's dual-outs.

MAXIMUM PC VERDICT

Price $1,169
Company Premio PC
Phone 888.352.9776
URL www.kaypro.com

Copyrighted material

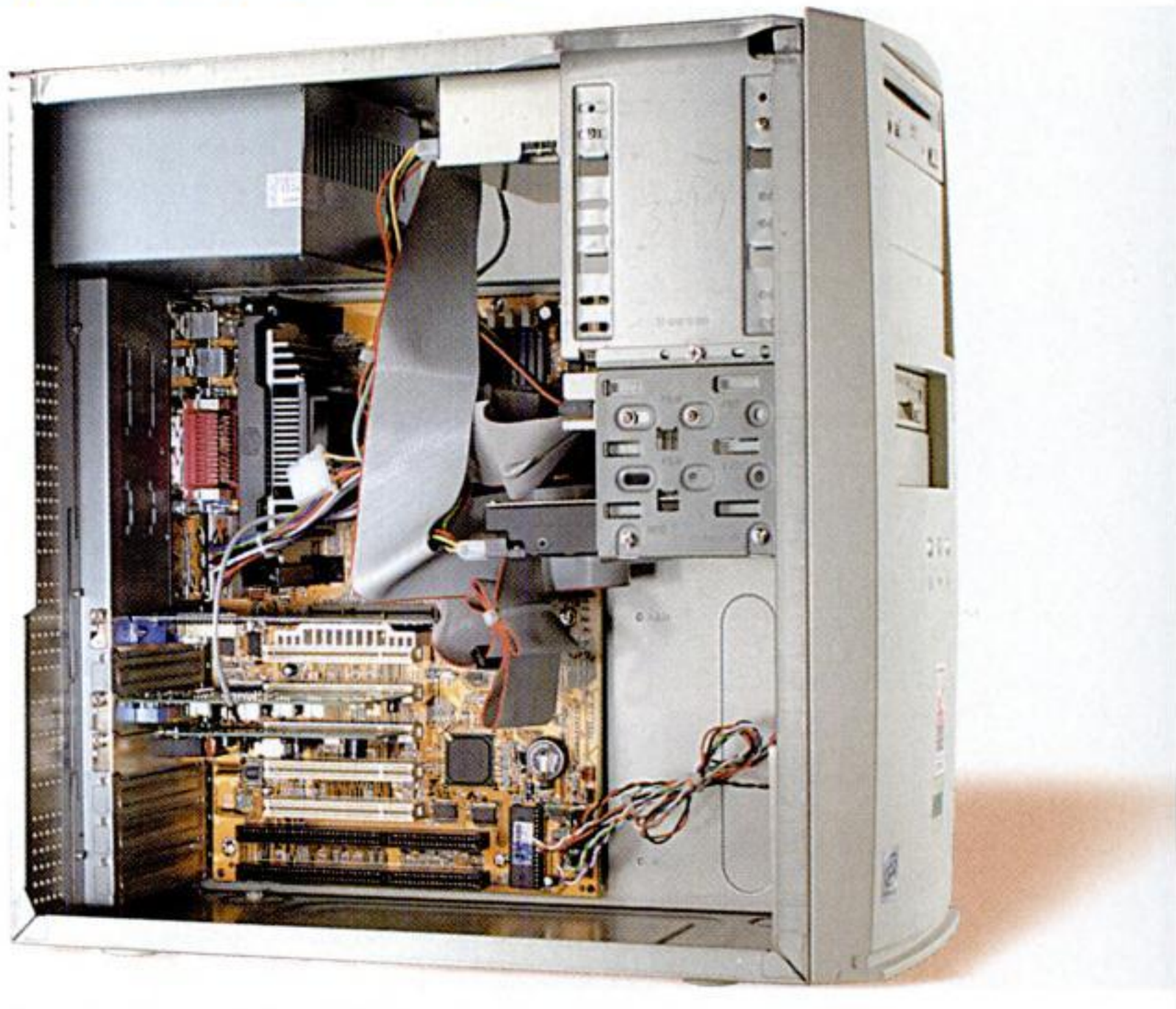
axis orion 100

A VERITABLE SWISS ARMY KNIFE—PLAY, WORK, OR TINKER

Axis Systems exercised caution when configuring its $1,500 contender. The machine could have easily slipped into mediocrity, but it emerged as a well-balanced box that's ready for both entertainment and work duties.

Axis boasts the second fastest processor in the round-up, a 550MHz P-III Katmai. The extra 50MHz helps the Axis step away from the 500MHz contestants in almost every benchmark. The Orion 100 was runner-up in five out of eight benchmarks, including the punishing *SYSMark 98*, which runs PCs through a scripted obstacle course of Windows applications. Only the Quantex, armed with a 600MHz P-III, blew the Axis away in the non-gaming benchmarks.

You may question the lifespan of 3dfx's Voodoo^3 line, but the Orion 100's V^3 3000 ran away in the Direct3D *Expendable* test, pushing out two more frames than the Micron's GeForce card. How could an old-school Voodoo^3 beat nVidia's new-school monster? It's the CPU, silly. Our *Expendable* test is heavily dependent on big iron, and we believe the 50MHz CPU advantage gave Axis the edge. In the less CPU-dependent *Quake II* test, the Micron's GeForce stomped the Voodoo^3 into the ground and nearly doubled Axis' score. Also know that the Voodoo^3 may leave you feeling empty as more games begin offering 32-bit color and large textures. Unless you're addicted to those Glide-only games, reconsider your Voodoo love affair.



This little pup peeks its face into high-end territory, but gets its nose burnt on the videocard.

EASILY OVERCLOCKED?
Yes! We hit 616MHz by tweaking the bus to 112MHz via soft jumpers

CPU UPGRADES
Mobo can P-IIIs up to 800MHz

SLOT MAP

AGP	Voodoo^3
PCI	Free
PCI	Yamaha Soundcard
PCI	V.90 modem
PCI	Free
PCI/ ISA	Free
ISA	Free

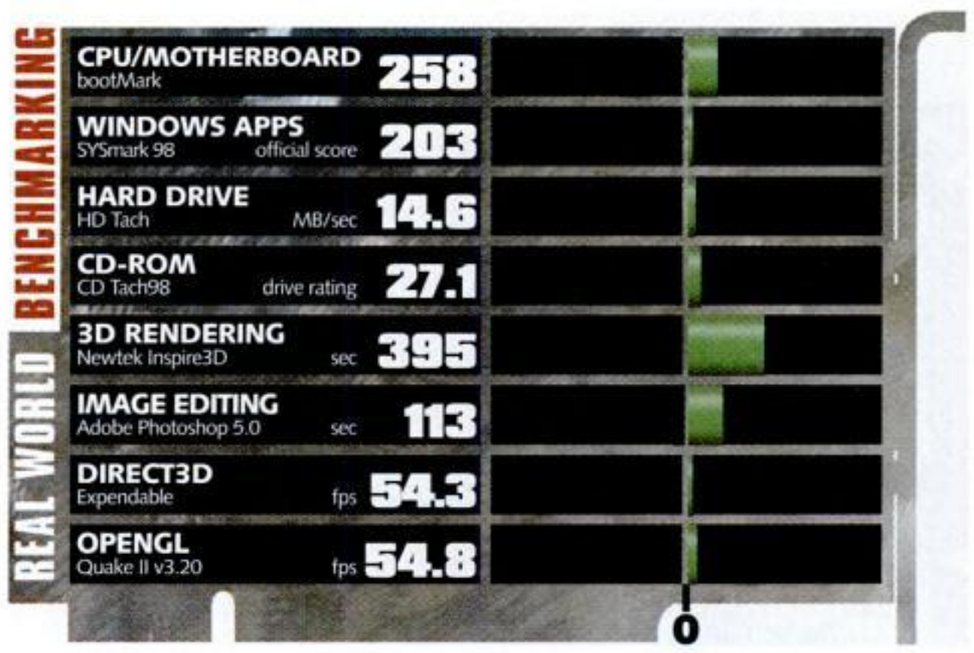
UNDER THE HOOD

THE BRAINS	
CPU	550MHz Pentium III
L2 Cache	512KB, half core speed
RAM	128MB PC100 SDRAM
Mobo	Abit BX-6 R2 (BX chipset)
Drive Bays	Three 5.25-inch bays (two open), three 3.5-inch bays (one open)
I/O Ports	Two serial, one parallel, two USB
DISPLAY	
Video	3dfx Voodoo^3 3000 16MB
Monitor	17-inch (0.28mm dot pitch)
Refresh@ Max Res	60Hz@1280x1024
STORAGE	
Hard Drive	13.6GB IBM DeskStar 22GXP (7200rpm, ATA/66)
CD/DVD	10x Pioneer DVD-104
Removable	Floppy
Fax/Modem	Lucent-based V.90 PCI modem
SOUND	
Soundcard	Yamaha YMF-742V PCI
Speakers	Altec Lansing ACS-33
THE BUNDLE	
CyberLink Soft Power DVD	

BOOT **1:11** DOWN **0:05**

Upgradability

The Axis machine has heating issues. The fan-less Voodoo^3 needs air flow—badly—and the Orion 100's case outright lacks it. We put a temperature probe on the graphics chip, and it hit 153 degrees Fahrenheit. This silicon needs active cooling! The medium tower case allows for the addition of a CD-R and Zip, but not much more beyond that. On the positive side, the Abit BX-6 R2 mobo will make overclockers happy, as its soft jumpers let you crank CPU speed and voltage up at will. It was a cinch to pump the Orion up another 62MHz on the Abit.



What we'd add for $500

The Abit board's main weakness is a lack of ATA/66 support. We'd spend part of our $500 to buy Promise's Ultra66 controller, and move the ATA/66 IBM DeskStar to 66MB/sec burst nirvana. You can't buy a faster DVD-ROM drive than the Pioneer 10x model, but the softDVD action has got to go. We'd spend another $80 to buy a Sigma Design's RealMagic Hollywood+ Decoder card. We'd also ditch the Yamaha YMF-742 PCI soundcard for either Creative Lab's Live! Value card or Aureal's SQ2500 card. Both offer quad sound for about $90 retail. A Klipsch Pro Media speaker set would round out our upgrades, and give us the power to shake bedrock.

MAXIMUM PC VERDICT

Price $1,482
Company Axis System
Phone 800.378.9014
URL www.axissys.com

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Micron Millennia Max

MICRON CRASHES THE PARTY WITH GEFORCE

Micron jumped at the chance to be included in this roundup, and once its GeForce-equipped Millennia arrived, we understood why. The Millennia features the same screwless case used in Micron's big rigs, and its GeForce card is the equivalent of bringing a gun to a knife fight. Not surprisingly, the Millennia performed nearly 400% better in our *Quake II* benchmark than some of the other machines. Likewise, the Max's ATA/66 IBM Deskstar hard drive towered over the other contestants in HD Tach. But before you start thinking the Millennia won the roundup, pay attention to the shortcuts Micron took: crap speakers, on-board audio, and a CD-ROM drive instead of a DVD-ROM drive.

Audio considerations aside, this box is perfect for gaming, fulfilling the three main requirements for ultra-fast fragging: a reasonably fast CPU (care of a 500MHz P-III), state-of-the-art videocard, and totally expandable motherboard that offers support for a Coppermine upgrade. As stated above, the Max rocked in *Quake II*, but lost by 3fps in *Expendable* to a Voodoo^3-based system. The rest of its benchmarks placed it neck-and-neck with the P-III 600 from Quantex and the P-III 550 from Axis Systems—despite both systems owning a clock speed advantage. The Micron tied the Axis Systems box with two best-of-roundup benchmarks. The Micron won *Quake II* and HD Tach, while Axis won *Expendable* and *Photoshop*.

Look at the case! And is that a GeForce card? Micron's entry treads dangerously close to the land of kick-ass.

EASILY OVERCLOCKED?
No! Zilch BIOS options; mobo jumpers only work with non-locked CPUs

CPU UPGRADES
Allows Pentium III Katmai/Coppermines up to 800MHz; also accepts Socket 370 CPUs

SLOT MAP

AGP	GeForce 256
PCI	Free
PCI	Free
PCI	Free
PCI	Free
PCI	Free
PCI	V.90 modem

UNDER THE HOOD

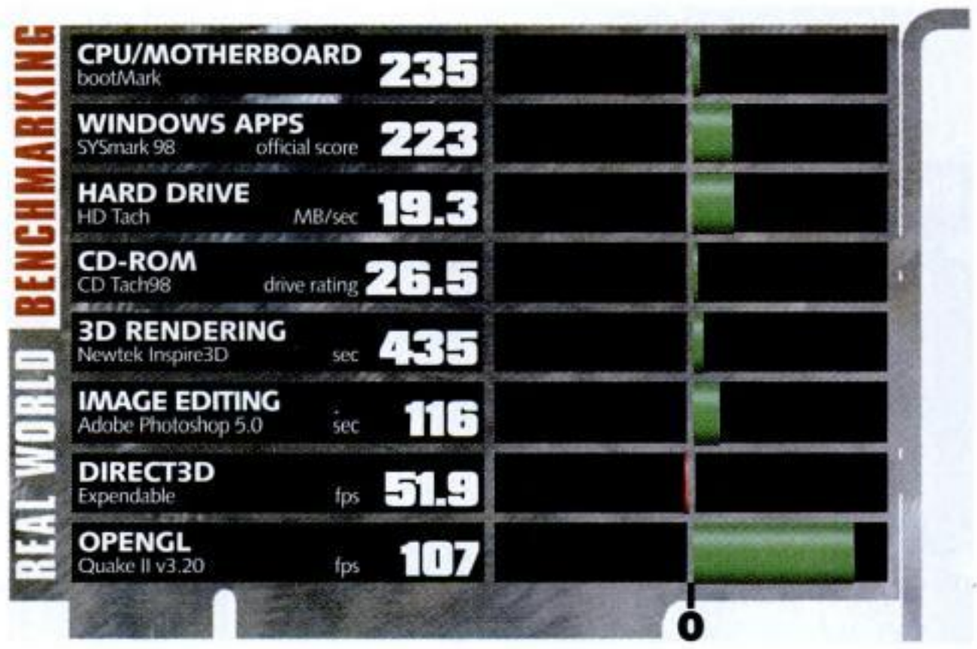
THE BRAINS	
CPU	Pentium III 500MHz
L2 Cache	512k closely coupled, half core speed
RAM	128MB PC133 SDRAM (768MB max)
Mobo	Tyan Trinity 400 (Apollo Pro 133A chipset)
Drive Bays	Three 5.25-inch (two free), five 3.5-inch (four internal, four free)
I/O Ports	Two USB, two serial, one parallel, gameport
DISPLAY	
Video	nVidia GeForce 256 (32MB SDRAM)
Monitor	17-inch (0.28 dot pitch)
Refresh@ Max Res	60Hz@1280x1024
STORAGE	
Hard Drive	13GB IBM Deskstar 34GXP (ATA/66, 7200rpm)
CD/DVD	40x NEC 282
Removable	Floppy
Fax/Modem	56K V.90 Lucent PCI
SOUND	
Sound	Creative Labs PCI128 on-board
Speakers	Advent AV009
THE BUNDLE	
None	

BOOT 1:02 DOWN 0:02

Upgradability

The star of the Micron show is its motherboard, one of the most inviting mobos in the roundup. A Tyan Trinity 4000, it boasts both Slot 1 and Socket 370 interfaces, has six PCI slots, and runs the VIA Apollo Pro chipset, which supports AGP 4x, PC133 SDRAM, and a 133MHz frontside bus. The board boasts no evil ISA slots, and you can plug every PCI card you own into the five open slots. The mobo also supports Coppermine CPUs "up to 800MHz" according to Micron.

The case rocks, too. It includes two fans to blow out cool air, as well as enclosures for two fans on top of the PCI slots, for even more cooling. The case is all plastic, with nary a screw to be found in its design. The motherboard pops out in a jiffy, and a thumbscrew keeps any add-in cards in their rightful place.



What we'd add for $500

There's not a lot to upgrade here, but the first thing we'd purchase is a 3D soundcard; specifically, a Soundblaster Live! Value for $75. Next, we'd take a set of Klipsch ProMedia speakers for $250, so we could piss off our neighbors while playing *Quake III*. We'd also bump the RAM up to 256MB, which would cost $175 for a 128MB PC133 DIMM.

MAXIMUM PC VERDICT

Price $1,499
Company Micron PC
Phone 888.224.4247
URL www.micronpc.com

Copyrighted material

Quantex SM600

FASTEST CPU PUTS QUANTEX ON TOP

As swift as a greyhound, the Quantex and its 600MHz Pentium III "B" easily sprinted past the rest of the pack in our CPU-dependent benchmarks.

Taking top honors in five out of eight tests, the Quantex appears to give more bang for the buck than any other $1,500 PC. This much CPU performance comes at a price, however. To keep within the constraints of our pricing limit, Quantex offset costs by using an old-school nVidia TNT card. While a great performer in 1998, the TNT gets lumped up badly when going against modern contenders. Still, the Quantex stole every non-gaming benchmark we ran.

EASILY OVERCLOCKED?
Yes! We hit 675MHz by taking the bus to 150MHz via BIOS tweaks

CPU UPGRADES
You can hit 800MHz on 133MHz bus

SLOT MAP

AGP	TNT Card
PCI	Free
PCI	Vortex soundcard
PCI	Free
PCI	Lucent V.90 Modem
PCI/ISA	Free
ISA	Free

Upgradability

This machine's hot part is the MSI MS-6199VA motherboard, which runs the 600MHz P-III on a 133MHz frontside bus. We didn't think a "B" series Katmai P-III would appreciate riding on a bus faster than 133MHz, but minor tweaking in the BIOS netted us 675MHz on a 150MHz bus. The MSI board allows for clock speeds past 800MHz, and lets you adjust core voltage settings as well.

The VIA Apollo Pro 133A chipset supports 133MHz SDRAM, 4x AGP, and ATA/66. The faster CPU and system bus give Quantex a leg up over the competition, but the machine somehow lagged behind the Axis Systems box by seven seconds in our *Photoshop* test. On the flipside, the Quantex smoked all comers in *Inspire* and *SYSmark 98*.

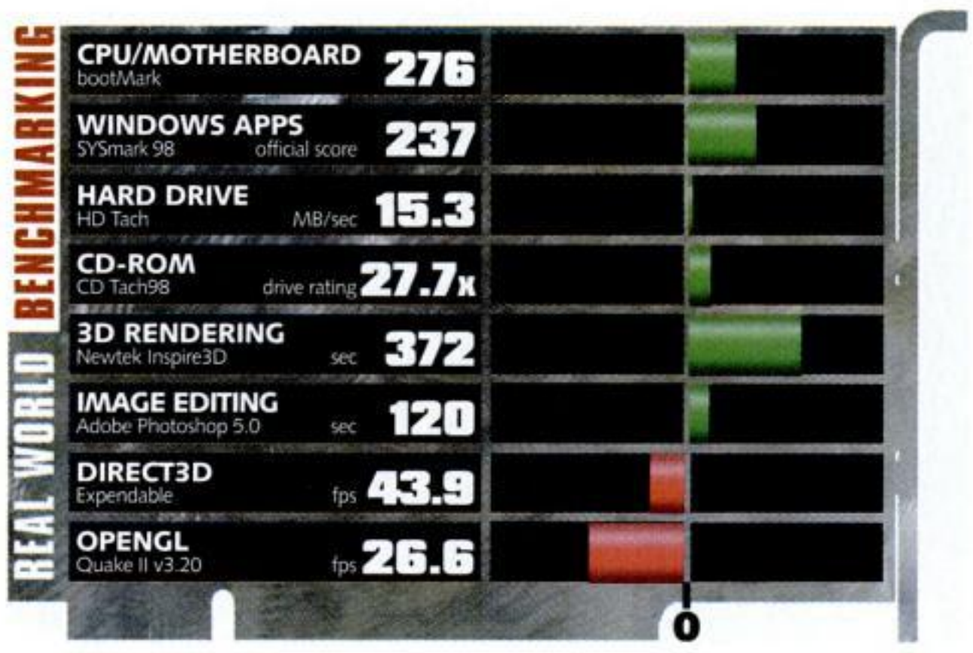
With a 600MHz CPU and 133MHz memory, this Quantex defies sub-$1,500 territory. But then there's the videocard...

The Quantex's mid-tower case is about average for hard-core upgrades, but it forces you to yank the power supply for access to the CPU. We prefer full-size cases, but the Quantex should give you enough wiggle room to add a CD burner and Zip drive.

What we'd add for $500

The first thing we'd do is yank out the TNT card and fling it across the room. We'd spend half our budget on an nVidia GeForce card, or, for $50 less, we'd buy Diamond's Viper II card, which is based on the Savage 2000 chipset. We'd also pick up a 7200rpm hard drive, and relegate the Maxtor DiamondMax to MP3 storage.

All in all, Quantex brought some great hardware to the table, so we don't have a lot of nagging upgrading desires. Dig the 8x Toshiba DVD-ROM drive and Aureal Vortex 2 soundcard. Alas, this Vortex 2 is slightly clipped, as it offers only a single analog out. Gamers will need to upgrade to a card with dual stereo-outs if they want menage-a-quad 3D sound. There's no need for a faster DVD-ROM drive yet, but we're not big fans of softDVD decoding, so we'd spend $75 for a Sigma Designs Hollywood Plus card, and pipe the DVD to our TV set.



If we wanted an all-out gaming machine, we'd go with the Micron and its GeForce. For overall balance, we'd chose the Axis Systems box. But for pure performance in productivity apps, the Quantex is numero uno.

UNDER THE HOOD

THE BRAINS	
CPU	600MHz "B" Pentium III
L2 Cache	512KB half speed
RAM	128MB PC133 (768MB max)
Mobo	MSI 6199A (VIA Apollo Pro 133A chipset)
Drive Bays	Three 5.25-inch bays, two 3.5-inch bays
I/O Ports	Two serial, one parallel, two USB
DISPLAY	
Video	Generic nVidia TNT 16MB
Monitor	17-inch (0.25mm dot pitch)
Refresh@ Max Res	60Hz@1600x1200
STORAGE	
Hard Drive	13.6GB Maxtor DiamondMax
CD/DVD	Toshiba SD-M1302 8x/40x
Removable	Floppy
Fax/Modem	Lucent-based V.90 PCI modem
SOUND	
Sound	Aureal Vortex 2 PCI
Speakers	Altec Lansing ACS-33
THE BUNDLE	
Corel WordPerfect Office Suite 2000	

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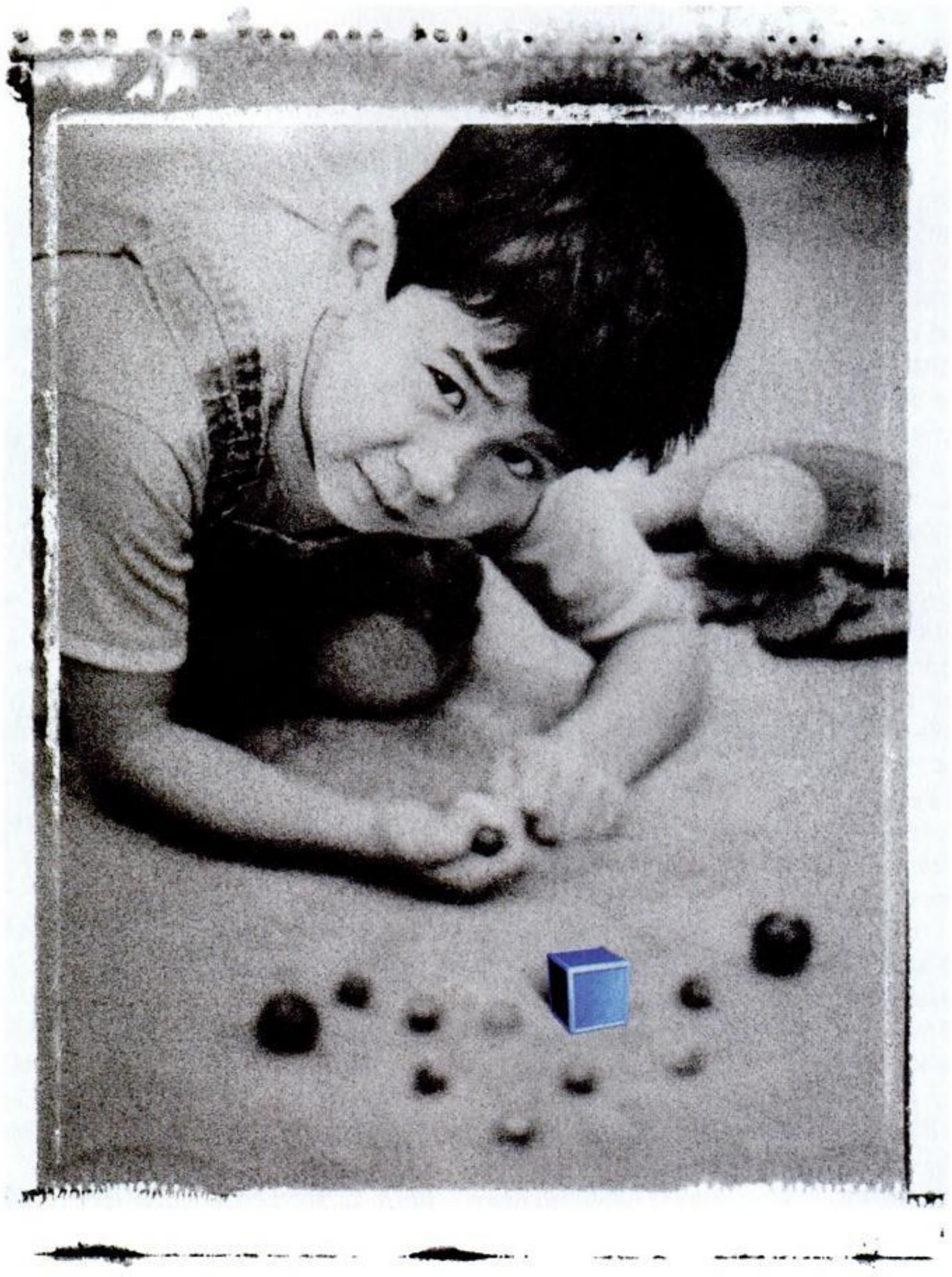

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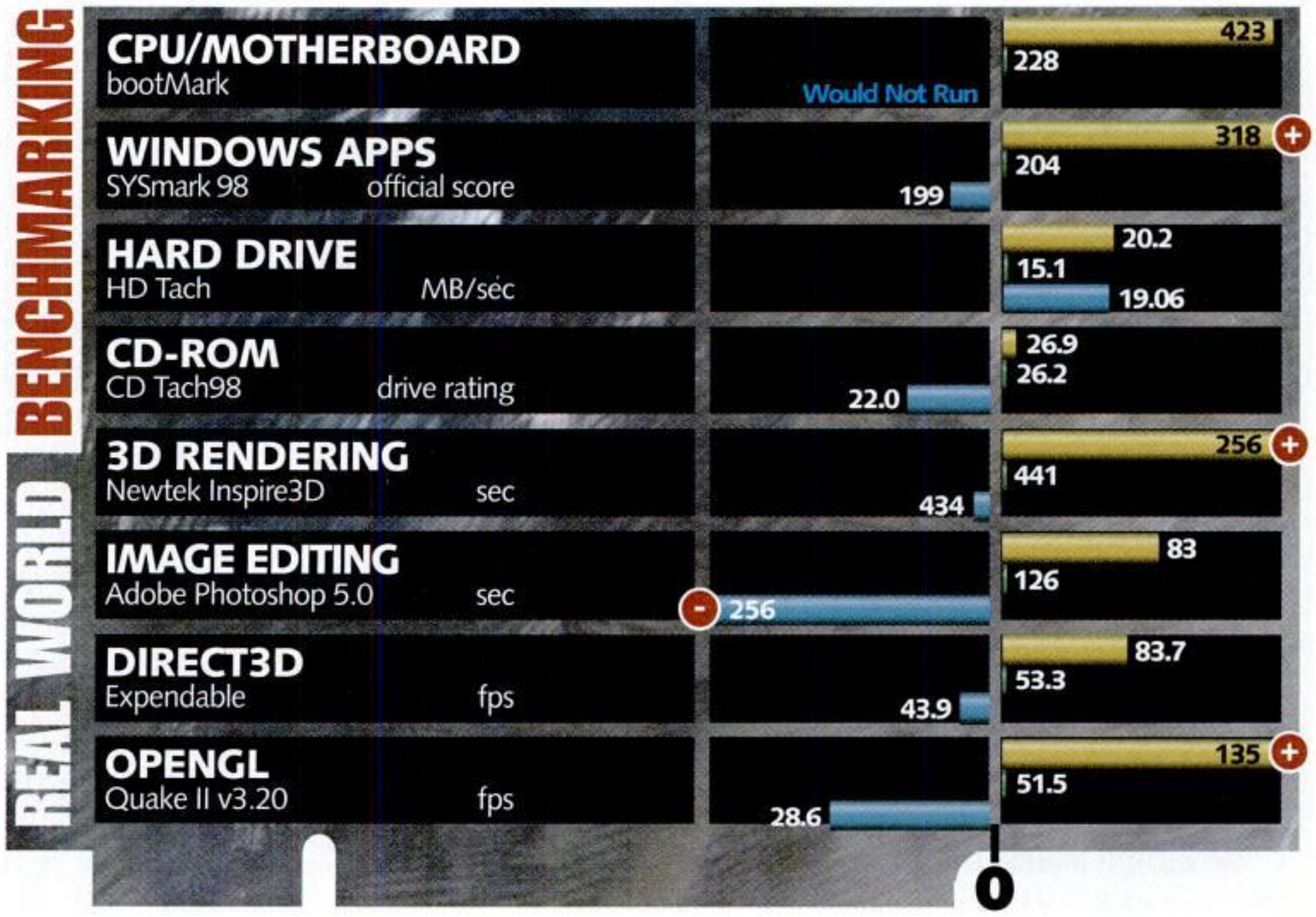
THE PC performance gap

The disparity between today's wimpiest and hardiest PCs continually blows our minds. To illustrate this point, we compared the scores of one of the fastest systems we've ever benchmarked—the $3,900 Dell B800R found on page 76—to the $900 eMachine eMonster, the runt of this month's cheap PC round-up. In the chart below, we also provided numbers for our "zero-point" reference system, which is detailed on page 75.

As the chart illustrates, today's most expensive systems obliterate the cheapie systems. But please note that the performance gap isn't that dramatic when it comes to CD-ROM and hard drive scores. No, it would appear that when you're buying a high-end PC, what you're really paying for is cutting-edge CPU, memory, and videocard power. Still, this isn't to say that the absolute bottom-feeders of the PC pool don't come with bunko hard drives. When you get down to really cheap systems—like the $600 Micro-Star on page 49—hard drive performance becomes a farce.



Cheap PCs: Dog Eat Dog Eat Dog Eat Dog Eat Dog

Here's an overview of where the system vendors cut corners when faced with our $1,500 ceiling. Please observe that the biggest name OEMs were able to squeeze in such niceties as faster CPUs, newfangled chipsets and memory, and hot-hot videocards. So, how did they do it? Well, if you have a whole bunch of capital sitting in the bank, you can make a mass order of, say, PC133 memory at a rock-bottom price, and then pass along the cost savings to the consumer. Also, because big-name OEMs sell so many PCs, they can decrease overall pricing and still enjoy a profit. It's all about economies of scale.

DARE TO COMPARE

COMPUTER	EMACHINE EMONSTER	KINGDOM PINNACLE	PREMIO KAYPRO	AXIS ORION	MICRON MILLENNIA	QUANTEX SM600
CPU	Pentium III 500	Pentium III 500	Pentium III 500	Pentium III 550	Pentium III 500	Pentium III 600 "B"
Mobo/Chipset	TriGem NP77ZX/ Intel ZX100	Tekram P6BX/ Intel BX	Premio 212 E/BX	ABIT BX-6/ Intel BX	Tyan Trinity 400/ Apollo Pro 133A	MSI 6199A/ Apollo Pro 133A
Video Card	ATI Expert 128 16MB	nVidia TNT2 Vantra 16MB	Matrox Millenium G400 32MB	3dfx Voodoo^3 3000 16MB	nVidia GeForce 256 32MB	nVidia TNT 16MB
Monitor	17-inch	19-inch	17-inch	17-inch	17-inch	17-inch
Memory	64MB PC100	128MB PC100	64MB PC100	128MB PC100	128MB PC133	128MB PC133
Hard Drive	13GB TriGem SV1363D	13.6GB Maxtor DiamondMax 36	10.1GB IBM DeskStar 14GXP	13.6GB IBM DeskStar 22GXP	13.6GB IBM DeskStar 34GXP	13.6GB Maxtor DiamondMax 36
CD/DVD	Samsung SD-608 8x DVD-ROM	Delta OIP-CD400A 48x CD-ROM	Mitsumi FX4820T 48x CD-ROM	PioneerDVD-104 10x DVD-ROM	NEC282 40x CD-ROM	Toshiba SD-M1302 8x DVD-ROM
Speakers	Generic P.O.S.	Midi Land MLI 450	MLI 130 two-piece	Altec Lansing ACS33	Advent AV001	Altec Lansing ACS33
Sound sub-system	Crystal Semiconductor CS4280 (on-board)	Yamaha PCI YMF-742V	Creative Labs Sound Blaster Live! Value	Yamaha PCI YMF-742V	Creative Labs PCI 128 (on-board)	Aureal-based Vortex 2
Price	$900	$1,497	$1,169	$1,482	$1,499	$1,500
Verdict	5	5	6	7	8	8

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Teaching your old dog new tricks...

While an ultra-low price is always worth a verdict point or two, none of the systems in this round-up really threatened to enter kick-ass territory. From CPU to video, and from storage to sound, these PCs are as compromised as a politician on Election Day.

But what do these compromises actually cost you? Dig the abysmal pass-fail results below, and you'll see that some PCs could barely break our "zero-point" reference marks—the minimum scores necessary to get your foot into the Pure PC Power club.

Does your home PC stumble through the pass-fail tests too? Well, if you can handle a Leatherman tool and plug in a PCI card, you can pump more life into any blue-light special. To emphasize this point, we took a Taco Bell chihuahua and turned it into Cujo. Our results can be found in the captions to the right.

► What You Should Upgrade First

When upgrading your dog of a system, you should simply consider your needs. If you do a lot of image editing, add more RAM. In our *Photoshop* tests, we found that doubling memory from 64MB to 128MB shaved more than a minute off our scripted chores. But don't stuff 384MB of memory into a cheap PC and expect miracles. In Windows 98, you'll hit diminishing returns pretty quickly; 256MB is typically the practical limit.

Are you also into 3D rendering and 3D gaming? If your duties are number crunching-dependent, a faster CPU should be a priority. Just be sure to check with your mobo or system vendor to determine the fastest CPU you can plug into your motherboard. In this month's shootout, some of the boxes could accept Intel's latest-greatest 800MHz CPU on either a 100MHz bus or 133MHz system bus. And if you don't think a 800MHz Coppermine P-III offers more pep than a 400MHz Pentium II or overclocked Celeron, you're sorely misinformed. Just check out our tests on the next page, which compare a 600MHz P-III to the 400MHz Cellie. If you can afford the metal, spend the money for it.

In 3D games, a superfast videocard can offer more oomph than a new CPU. Are you still running an original Voodoo, Riva 128, or i740? It's time to upgrade, baby. If you're equipped with a processor that runs at 400MHz or faster, you can buy a next-gen AGP videocard without worrying about bottlenecks occurring on the CPU or system bus level. Right now, your videocard choices are: nVidia's GeForce or TNT2 Ultra; Matrox's G400; S3's Viper II; ATI's Rage Fury Maxx; or any of the Voodoo^3 cards from 3dfx. For specifics on which cards are best and why, read the last five issues of *Maximum PC*.

Are you satisfied with your CPU, memory, and videocard, but things just seem "slow"? Upgrading to a new 7200rpm, ATA/66 hard drive may provide the wake up your system needs, with faster rotation speeds, larger on-board caches, and faster burst rates. Just make sure your motherboard offers ATA/66 support, or buy an add-in ATA/66 controller card, such as Promises' Ultra66.

Pass/Fail Analysis

Every good system should be expected to hit a minimum level of performance. If the PC slips below that level, it can officially be considered crap. For the purpose of this chart, we used our "zero-point" system scores (see page 75) to establish the minimum levels of acceptable performance. If a system benchmark failed to meet its minimum, it failed our muster and received a dreaded "X."

Acceptable Score	204	15.1	126	51.5	26.2
QUANTEX	SYSMARK 231	HD TACH 15.3	PHOTOSHOP 120	QUAKE II 26.6	CD TACH 27.7
MICRON	SYSMARK 203	HD TACH 19.34	PHOTOSHOP 116	QUAKE II 107.3	CD TACH 26.5
AXIS	SYSMARK 223	HD TACH 14.6	PHOTOSHOP 113	QUAKE II 54.8	CD TACH 27.1
KAYPRO	SYSMARK 213	HD TACH 10.65	PHOTOSHOP 229	QUAKE II 41	CD TACH 21.2
KINGDOM	SYSMARK 205	HD TACH 15.36	PHOTOSHOP 131	QUAKE II 48.8	CD TACH 21.1
EMACHINE	SYSMARK 199	HD TACH 19.06	PHOTOSHOP 256	QUAKE II 28.9	CD TACH 22.0

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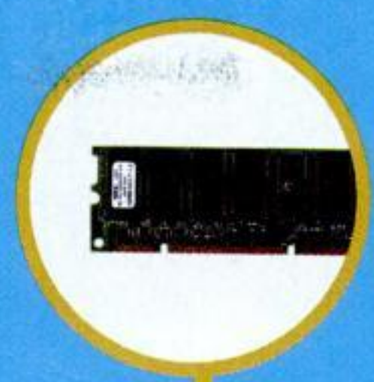
Before and After

This Micro-Star guinea pig sells for $600, and is based on a 400MHz Celeron. We didn't include it in our round-up because we feel no one should sink so low as to buy a PC of this performance caliber. But this machine does help illustrate the benefits of selective upgrading. Part by part, we removed individual components, replaced them with faster counterparts, and ran benchmarks to test how isolated upgrades affect performance. Then we replaced the weakling part and moved on to to the next subsystem overhaul. The results speak for themselves. (Upgrade parts are shown in inset photos.)



memory

Original Part: 64MB PC100 SDRAM
Upgrade Part: 128MB PC100 SDRAM
Test: *Photoshop* 5.0.2 Before: 260 sec. After: 180 sec.

videocard

Original Part: 8MB Diamond FireGL Pro
Upgrade Part: 32MB nVidia DDR GeForce
Test: *Expendable* Before: 8.8fps After: 92.2fps
Test: *Quake II* Before: 12fps After: 38.7fps

CD-ROM

Original Part: Compaq 32x
Upgrade Part: Kenwood 52x
Test: CDTach Before: 20x After: 40x

CPU

Original Part: 400MHz Celeron
Upgrade Part: 600MHz Socket 370 Pentium III
Test: bootMark Before: 120 After: 317
Test: *Inspire* Before: 554 sec. After: 338 sec.
Test: *Photoshop* Before: 260 sec. After: 158 sec.

Hard Drive

Original Part: 4GB Western Digital ATA/33
Upgrade Part: Maxtor ATA/66 with Promise ATA/66 controller
Test: HD Tach Before: 8.8MB/sec
After: 20.2MB/sec

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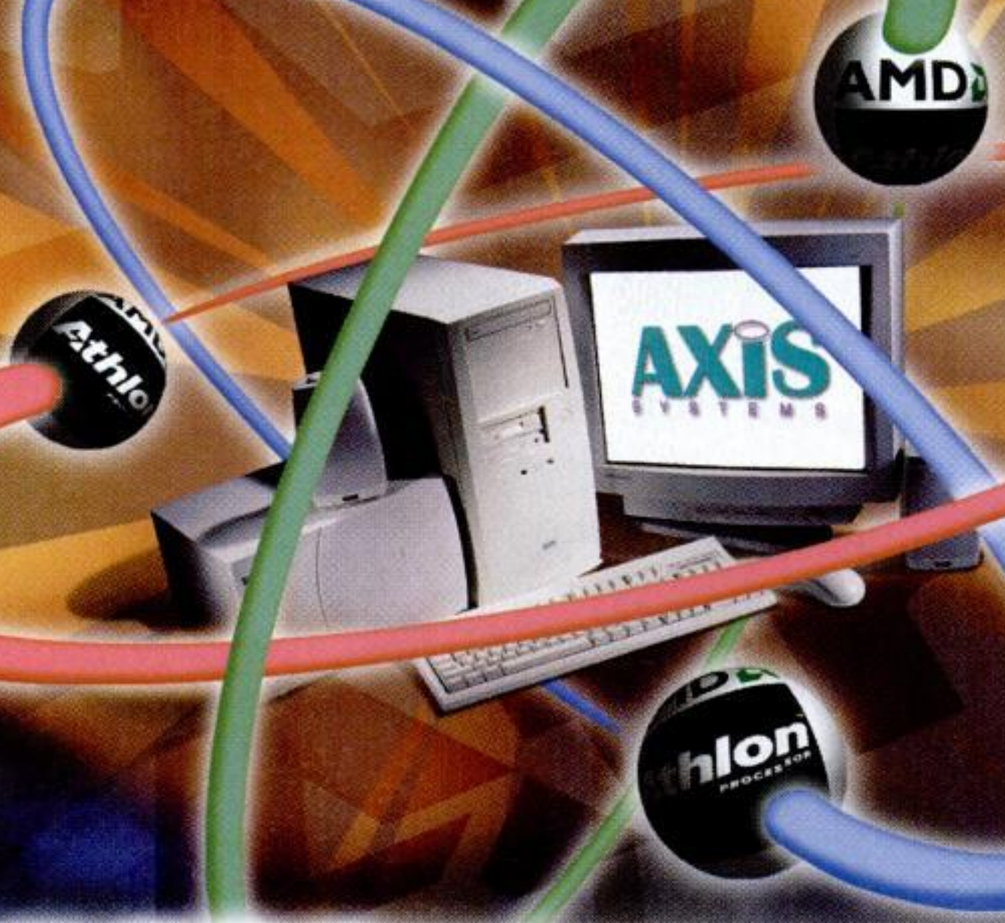

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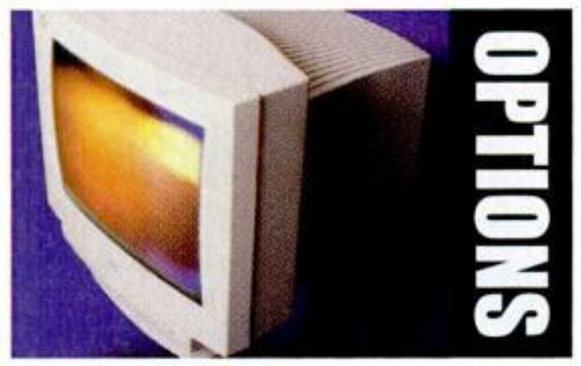

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MP3 STREET-ILLEGAL

DISPLAY

All we're really looking for in a display is something that can clearly show the name of the MP3 that's playing, and a bar that shows how long it's been playing. We went with a vacuum fluorescent display because VFDs yield readable characters regardless of the lighting situation, as opposed to LCDs, which are impossible to read when the sun is shining directly on them.

The particular VFD module we chose is highly programmable, and includes a book that clearly explains all the commands you can send to it over the serial interface connection. It also has room for plenty of song info on its four line by twenty-character-wide screen, and it supports simple bar graphics that you can program to visually display a song's playback progress.

Make sure that the VFD module you buy supports a keypad interface.

Take your MP3 collection on the road by building a custom-designed PC that thumps tunes in your car. We tell you how to put it together and make it run.

The appeal of popular music served up in piping hot MP3 nuggets is hard to refuse. But after you've packed a hard drive with your entire CD collection, your friend's CD collection, and the best tunes that every FTP site, Usenet newsgroup, and *Napster* search can find, all you have is a PC that acts as a jukebox for your compressed tunes. You can't take your entire MP3 collection with you when you walk away from your desk, and you certainly can't take it on a road trip. But if you could mate your PC with your car stereo, you could take all of your MP3s with you on the road. Imagine a long drive filled with only the music you want to hear.

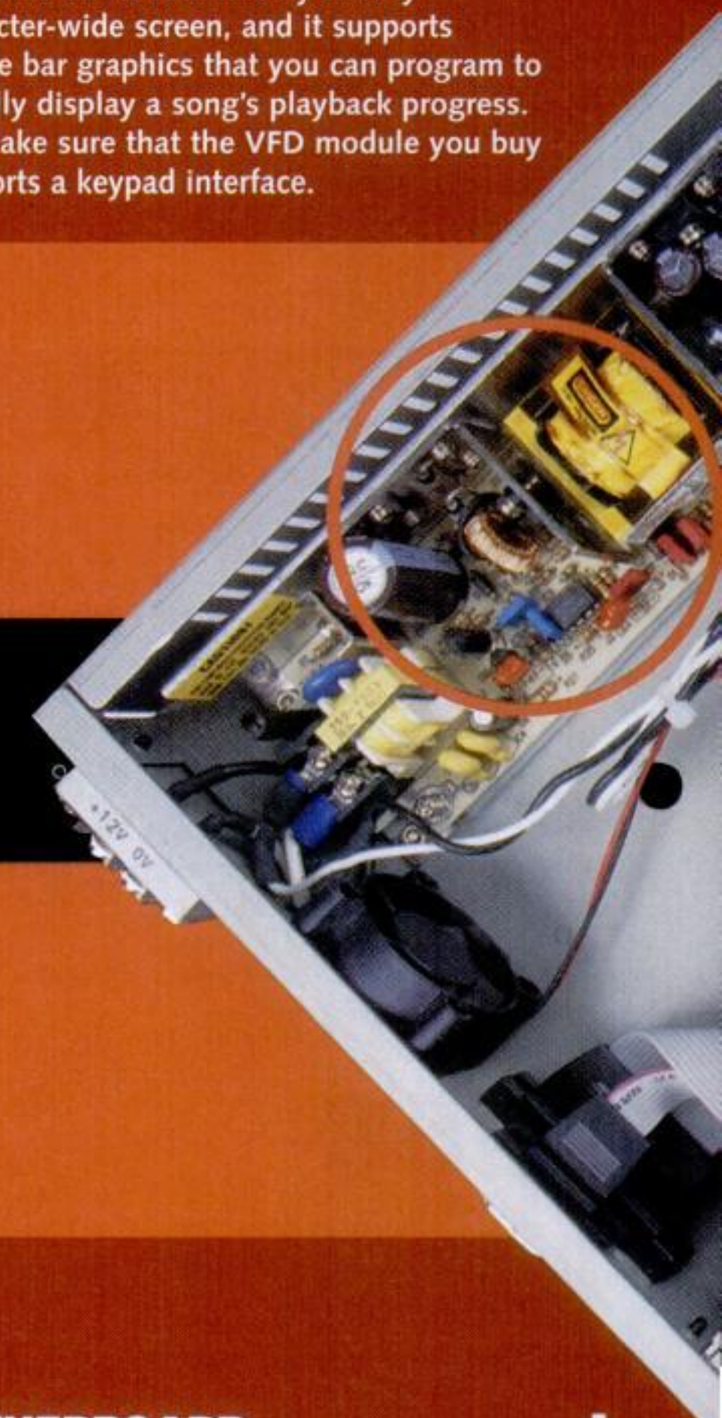
Anders Brownworth, our resident Linux guru, networking nice guy, and close personal friend, made this dream a reality. He took a hard drive, a soundcard, and a funky mob; stuffed them into a case that looks like a black pizza box, hooked up a vacuum fluorescent display, and wrote all the software that made it work. The Brownworth Box, as we like to call it, is designed to sit underneath your seat or in your trunk and feed music to your car stereo. It holds 296 hours of music—that's almost two weeks of nonstop tunes with no repeats—and features highly programmable playlists that ensure the only music playing is the music you want to hear.

Starting with a list of all the parts you'll need, we're going to take you step by step through the construction of this alternative PC system and tell you where to find the software that makes it run. We do have a word of warning, however, since this MP3 box is penguin powered: You should have at least a passing understanding of Linux, or you'll have a difficult time getting the software installed. Also, you should consider this an ongoing project—don't expect a hassle-free, consumer-level MP3 player at the end of the day. Anders will continue to develop the software that runs the box and incorporate any new hardware into the design as he sees fit. Check **www.maximumpc.com/route66** frequently to keep abreast of new developments.

If you're up to the challenge, follow our carefully prepared instructions to build the box that will make your MP3s mobile. In true open-source fashion, we've included all the design considerations that went into the selection of each part. Feel free to make improvements on Anders' design and tell him about your tweaks at **anders-mp3@elmer.imaginemedia.com**.

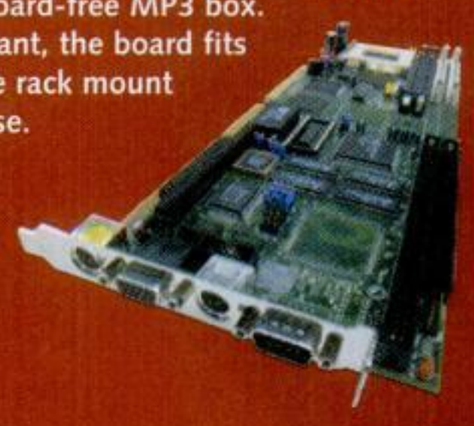
—Sean Downey

For definitions of Terminator words, hyperlink to the back of Maximum PC



MOTHERBOARD

A single board computer (SBC) is an appealing choice for our car MP3 player because it has everything we need onboard. Since they're designed for tight spaces such as set top boxes and Internet kiosks, SBCs cram the CPU, memory, IDE, serial, floppy, and video onto one compact package. The SBC model we used even does Ethernet, irDA, and USB, although we didn't include them on our particular board. Our board's BIOS supports booting without a keyboard, which is important for our keyboard-free MP3 box. Most important, the board fits well with the rack mount case we chose.



PHOTOGRAPHY BY AARON LAUER

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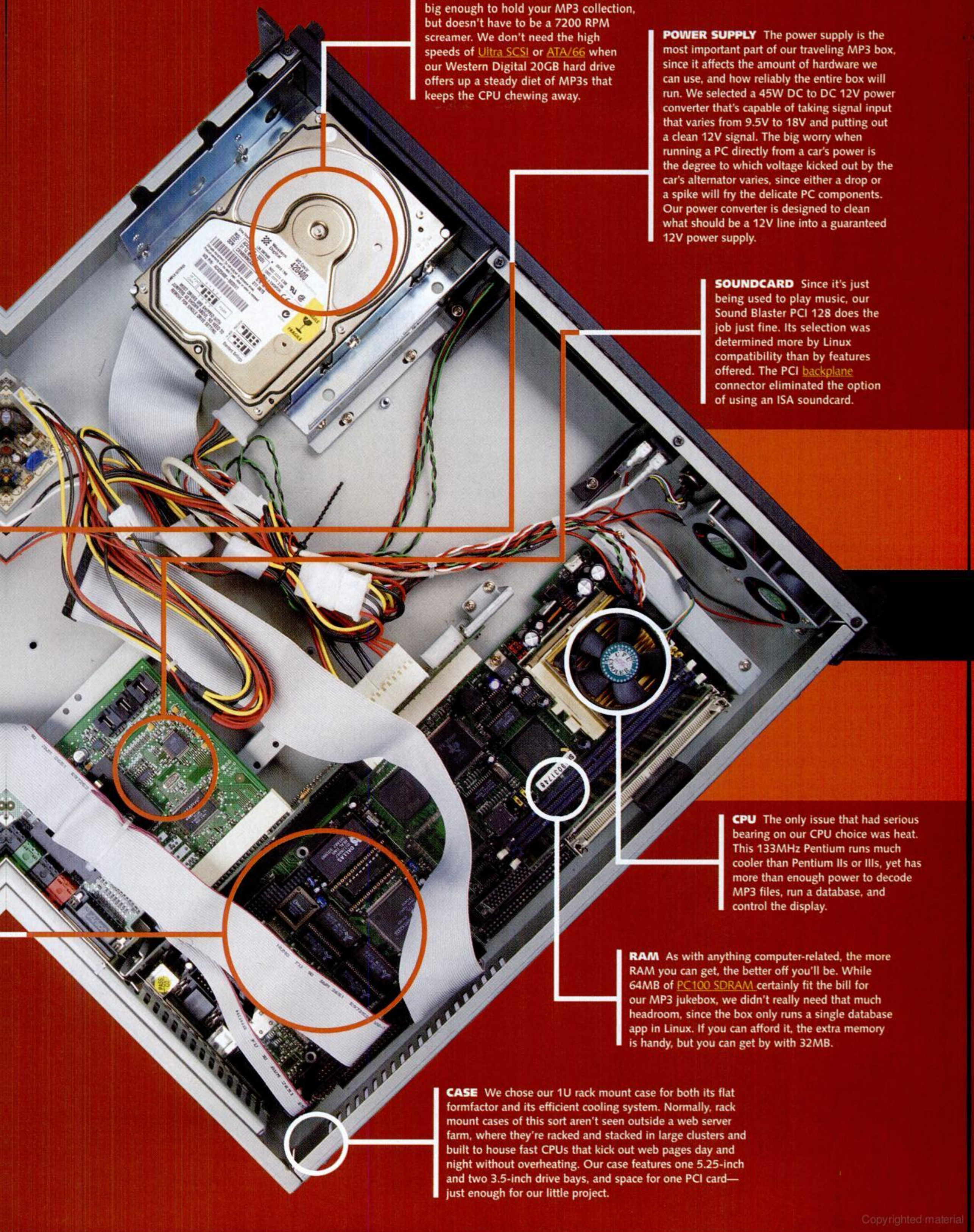

HARD DRIVE The hard drive must be big enough to hold your MP3 collection, but doesn't have to be a 7200 RPM screamer. We don't need the high speeds of Ultra SCSI or ATA/66 when our Western Digital 20GB hard drive offers up a steady diet of MP3s that keeps the CPU chewing away.

POWER SUPPLY The power supply is the most important part of our traveling MP3 box, since it affects the amount of hardware we can use, and how reliably the entire box will run. We selected a 45W DC to DC 12V power converter that's capable of taking signal input that varies from 9.5V to 18V and putting out a clean 12V signal. The big worry when running a PC directly from a car's power is the degree to which voltage kicked out by the car's alternator varies, since either a drop or a spike will fry the delicate PC components. Our power converter is designed to clean what should be a 12V line into a guaranteed 12V power supply.

SOUNDCARD Since it's just being used to play music, our Sound Blaster PCI 128 does the job just fine. Its selection was determined more by Linux compatibility than by features offered. The PCI backplane connector eliminated the option of using an ISA soundcard.

CPU The only issue that had serious bearing on our CPU choice was heat. This 133MHz Pentium runs much cooler than Pentium IIs or IIIs, yet has more than enough power to decode MP3 files, run a database, and control the display.

RAM As with anything computer-related, the more RAM you can get, the better off you'll be. While 64MB of PC100 SDRAM certainly fit the bill for our MP3 jukebox, we didn't really need that much headroom, since the box only runs a single database app in Linux. If you can afford it, the extra memory is handy, but you can get by with 32MB.

CASE We chose our 1U rack mount case for both its flat formfactor and its efficient cooling system. Normally, rack mount cases of this sort aren't seen outside a web server farm, where they're racked and stacked in large clusters and built to house fast CPUs that kick out web pages day and night without overheating. Our case features one 5.25-inch and two 3.5-inch drive bays, and space for one PCI card—just enough for our little project.

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How to build the

Here are all the nitty-gritties on how to put together our Anders Brownworth-designed car MP3 player. There's a lot more to this little black box than meets the eye—much more than your average PC. The design takes into consideration both the widely ranging operating temperatures and the constant jostling that comes from being in a car, so be sure to read this entire article before cracking the case.

SHOPPING LIST

We bought most of our MP3 box's big-ticket items online, but we picked up a lot of parts as needed from local stores. Shop around. You'll probably be able to find these same parts for a lot less at an online hardware site. Just be sure to use a reputable dealer.

- **Case and mobo**
  (www.arisecomputer.com) **$685**
  - 1U rack mount case with PCI backplane
  - 45W DC to DC 12V power converter
  - 133MHz Pentium 586 single-board computer (HS-5060V)
- **Vacuum fluorescent display system**
  (www.linuxcentral.com) **$205**
  - Push-button keyboard with ribbon connector for vacuum fluorescent display (VFD)
  - VFD module and drive-bay insert
- **64MB PC100 SDRAM DIMM**
  (local computer store) **$70**
- **Sound Blaster PCI 128 soundcard**
  (local computer store) **$45**
- **20GB Western Digital IDE hard drive**
  (local computer store) **$265**
- **Wires and adapters**
  (local Radio Shack) **$21**
  - Cigarette lighter power adapter
  - Power line-noise filter cap
  - 12 AWG speaker wire for system power
  - Mini phone-jack wire for line-in installations, or stereo mini-DIN to RCA, depending on car stereo connection
- **10 foot serial cable**
  (local computer store) **$6**

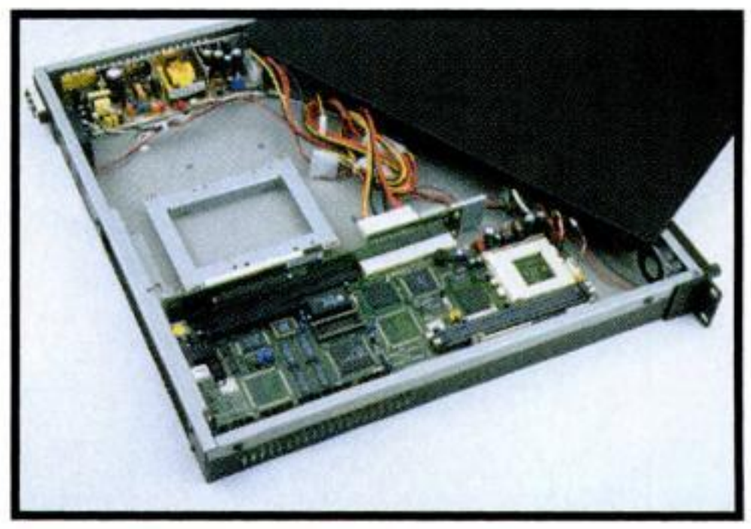
TOTAL **$1,297**

OPTIONAL ITEMS:

- **Floppy drive**
  (local computer store) **$17**
- **120V AC power supply**
  (local computer store) **$48**
- **Car installation**
  (local car stereo shop) **$120**

1 Open Case

Arise Computer (or whatever company you purchase your case from) will custom configure your rack mount case with whatever power supply, single-board computer (SBC), and CPU you want in it. They'll even do the custom hack job needed to install the 12V screw connectors on the back of the case, instead of the standard three-pronged power connector (just tell them that *Maximum PC* sent you). The 12V screw connectors are necessary for the custom wiring you'll need to do in order to feed power into the box from the cigarette lighter, or directly from the car.



Remove the eight screws that hold the cover on the case, and feast your eyes on all the work that's already been done for you.

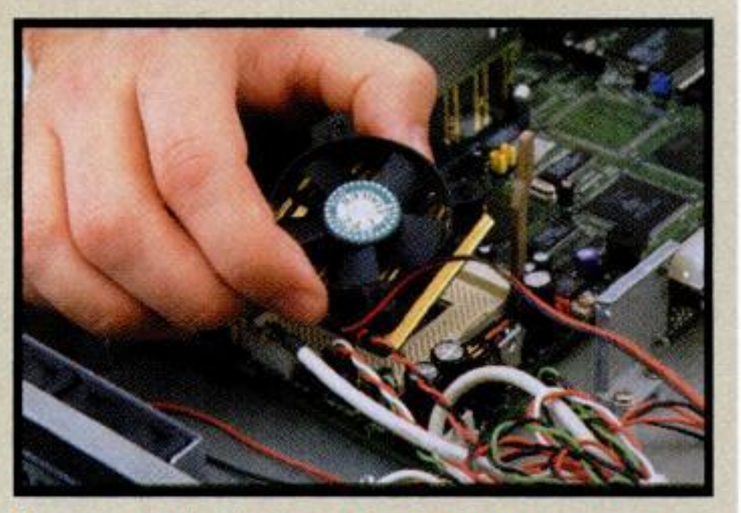
The case will arrive at your house with the hardware pre-installed, so you don't have to figure out how to securely mount the SBC, or how to get the funky AT power converter properly in place. If you feel like proving your tech manhood by installing a different power converter and SBC yourself, keep in mind that any hardware you put in the box needs to stay insulated from the case regardless of the bumps and shakes the box endures. This means not only mounting the SBC on standoffs, but also packing non-conductive rubber pads between the walls and the board.

2 Install CPU & RAM

If you follow our lead and use a 133MHz CPU, you'll need to refamiliarize yourself with the ZIF socket. The ZIF socket is designed to properly line up the processor pins and ease them into place without bending them. Just lift up the socket lever, line up the cut-off corner on the processor with the one in the ZIF socket, and lock the socket lever back down.

Our SBC uses jumpers to set the CPU multiplier, voltage, and bus clock settings, so once the processor is in place, look in the SBC's manual to verify that the board jumpers match up with the appropriate CPU settings.

Installing the RAM is even easier, since each DIMM's connector is notched to go in only one way. Line up the DIMM and push down; the thumb clips will snap around it.



The pins on the bottom of a Pentium processor are designed to fit into a motherboard only one way.

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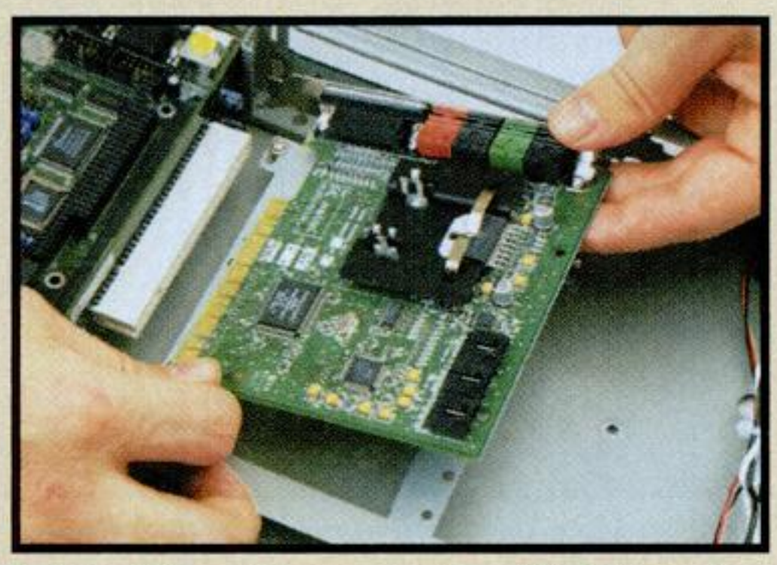
MP3 Box in 11 easy steps

3 Install Soundcard

Installing the soundcard may seem like an easy task, and with a standard mobo it is—you just drop it into a PCI slot and screw it into place. But since the SBC is hooked up to a backplane, the soundcard has to limbo into place. The SBC's backplane is a short, vertical circuit board that connects the PCI soundcard and power supply on one side, and the SBC on the other. With a backplane, everything lies down flat and out of the way, which is handy in a pizza-box-style case such as ours.

When inserting the soundcard, be sure that the gold connectors along the bottom of the card are flush with the slot, and check to see that the unconnected end of the soundcard won't touch the case, no matter how big a pothole the car hits.

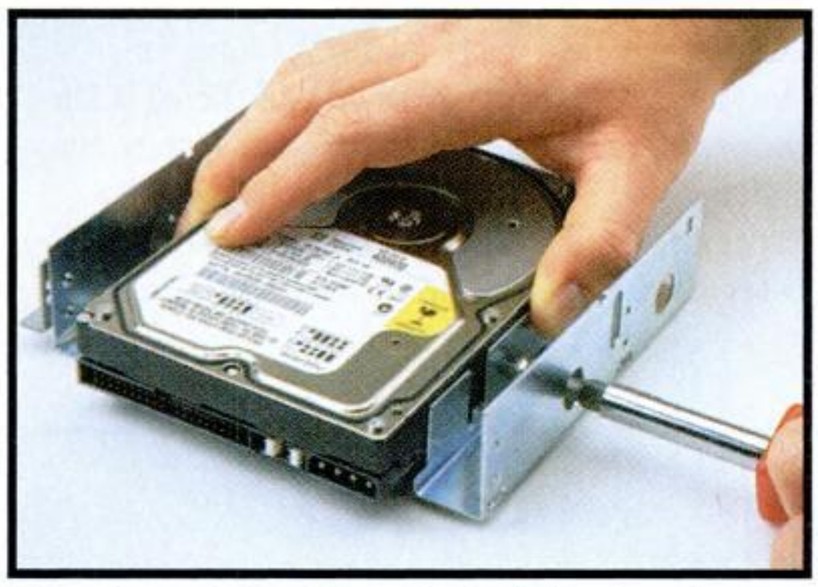


Both the SBC and the soundcard must lie flat in order to fit in their sockets.

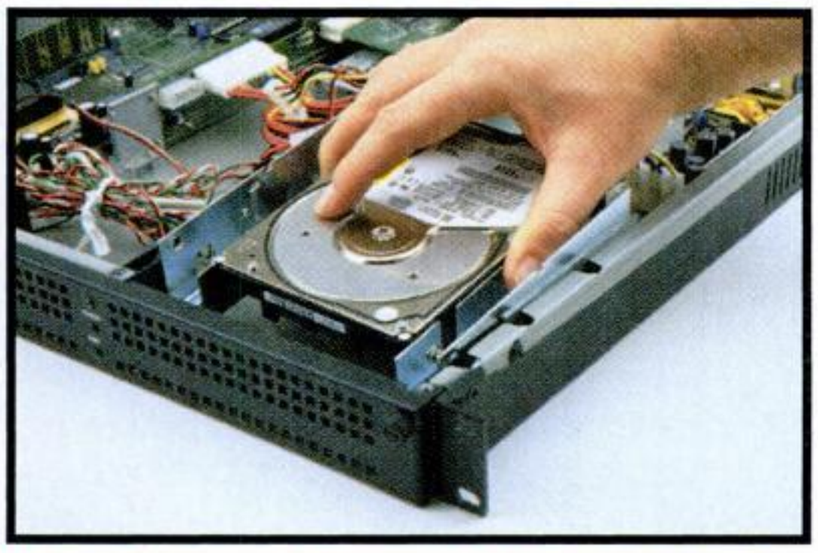
4 Install Hard Drive

While the case comes with a 3.5-inch drive bay that can easily accommodate a hard drive, it's a good idea to use 5.25-inch rails to provide the extra suspension that will keep the hard drive from shaking too much. While the constant shakes and bumps that occur during everyday driving aren't a problem for any but the most motion-sick individual, they're murder on a hard drive. If it takes too big a jolt, the hard drive could suffer a head crash, which occurs when the drive's read head runs into the disk platter. A head crash will permanently destroy any data stored on the drive's platter. This is a bad thing.

Drive rails should help to prevent this. Just attach the rails to each side of the hard drive and mount the entire thing in the 5.25-inch drive bay. And if you really want to cushion your hard drive, you can also put rubber grommets underneath the rails.



These drive rails should keep the hard drive from being jostled too much.



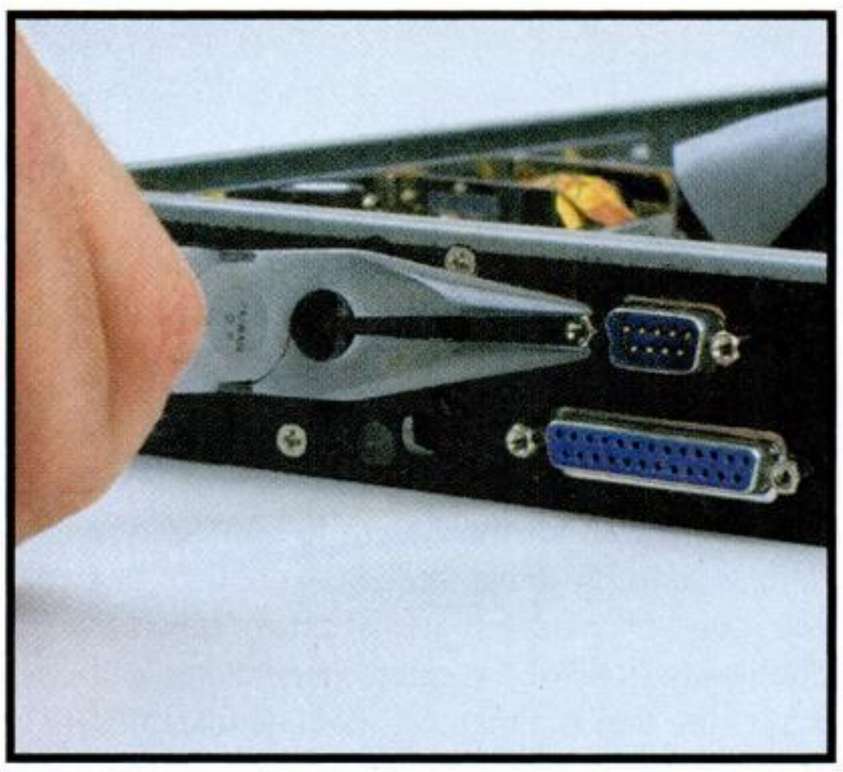
With the drive securely connected to the drive rails, you can mount the entire thing to the case.

5 Connect Power & Cables

With the hard drive securely installed, you can now connect the IDE ribbon cable and hook up power. Just be sure that Pin 1 on the ribbon cable (the side marked with a red stripe or lettering) matches up with Pin 1 on the back of the hard drive and Pin 1 of the IDE1 connector on the SBC. Also, look for the rounded edges on the power connector before inserting it, and be sure that they match the hard drive's rounded plug.

The two other cables you should connect at this time are for the parallel port and the serial port connectors. Follow the Pin 1 rule outlined above when connecting the cables to the SBC, and secure them on the back side of the case with a pair of needle nose pliers.

Pin 1 on your IDE hard drive is generally on the side closest to the power connector.



The parallel and serial connections should come pre-installed by the company that sold you the case. If they aren't, it's pretty easy to screw them into place with a pair of needle nose pliers.

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com

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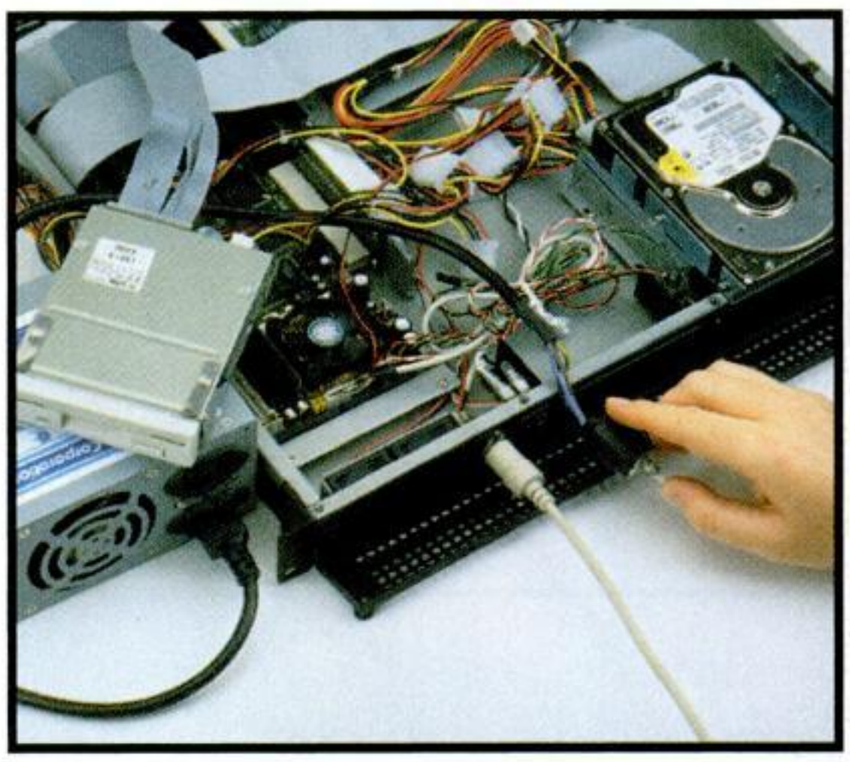
6 Make a PC out of it

Now that the basic system is constructed, make sure that it works. Since the Brownworth Box is still a PC at heart, you'll need a keyboard, monitor, and 200W AT power supply to get it up and running. When connecting the power supply to the split-plug AT connector on the backplane, remember that the plugs sit black-to-black (the black wire from one plug is beside the black wire from the other).



Before your box can be a lean, mean, MP3-playing machine, it needs to demonstrate that it can boot up. You need to hook up a power supply, keyboard, and monitor in order to test it.

Our case comes with both an AT keyboard connection in the front and an ATX connection in the back.

Once everything is connected, hit the power switch and wait for the system to boot up. If anything is seriously amiss, the SBC's onboard buzzer will sound off repeatedly—just power down the PC, double-check all of the cable connections, and make sure that the memory, CPU, and soundcard are all properly seated. If everything is properly in place and you still have problems, double-check the CPU jumpers to ensure that they match up to the correct CPU type.

7 Install Linux

With your hardware installed and running properly, you can now install Linux. You'll need a floppy drive and an IDE CD-ROM drive connected to your SBC. As an alternative to adding new hardware to your box, you can also take the hard drive out, hook it up to another PC, and install Linux there. As long as you compile the kernel with the correct drivers for the hardware that's in the MP3 box, you should have no problems setting up Linux with your hard drive installed in another PC.

We don't have the space to include step-by-step instructions for installing Linux (check out *Maximum Linux* for some great installation how-tos), but here are a few general pointers:

- Record the hardware details for your hard drive, soundcard, and CD-ROM drive. During the installation, you'll need this info in order to set things up just right.
- When preparing your hard drive for Linux, you should set up a 400MB partition for the OS, and a 32MB swap partition. Leave the rest for your MP3s.
- Do a minimal install. Don't add a bunch of packages that you'll never use, and don't install the default database software that comes with some Linux distributions.

Once Linux is installed on the hard drive, you can download and install the *Route66* software that plays the MP3s. Check out the Brownworth Project sidebar on page 57 for more info on this.

8 Load Up the MP3s

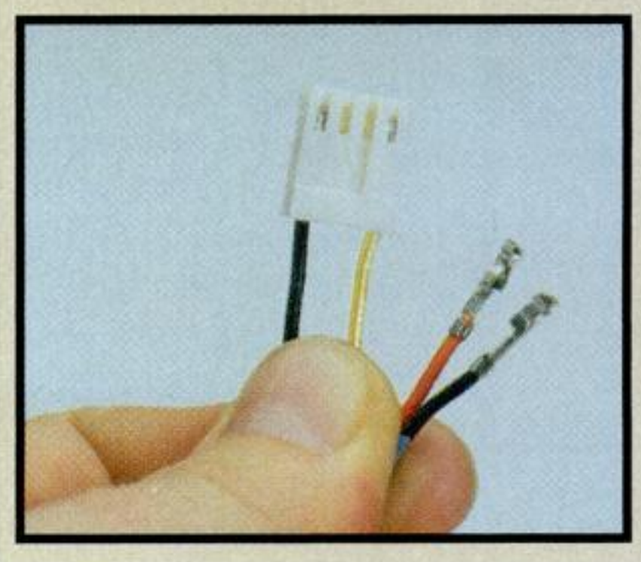
There are several ways to move your MP3 collection onto your newly constructed car MP3 player, but the easiest is to hook the hard drive that contains your MP3s up to the IDE connector of your box, and copy the files directly to the box's hard drive (Linux will recognize your Windows file system). If you're connecting the hard drive as a slave, be sure to change the jumper settings on the back before booting up.

You can also install a Zip drive in your MP3 box and move your files over 100MB at a time. This may take a long time initially, but in the long run, it will be easier to move new MP3s to your MP3 player's hard drive if there's a Zip drive in the box. If you're networking savvy, you can temporarily replace the soundcard with an Ethernet card and move the files across a peer-to-peer network. The ideal solution, of course, would be a long-range wireless networking kit that allows you to send files from the PC in your house to the MP3 box in your garage.

9 Set Up the Display

The display system is the most difficult part of your car MP3 player to set up. It requires some custom wiring, so if you weren't paying attention before, now is a good time to start.

Since the VFD module is a wide-voltage device, it can only accept power in the range of 9V to 15V—anything more and it will blow. In order to supply the right amount of power, you need to rig the floppy drive power connector so that it supplies 12V. To do this, remove every wire from the plug and re-insert just one black and one yellow wire. Plug the modified floppy connector into the VFD and



Be sure to rewire the floppy drive power connector before plugging it into the back of the VFD module. Read the VFD manual!

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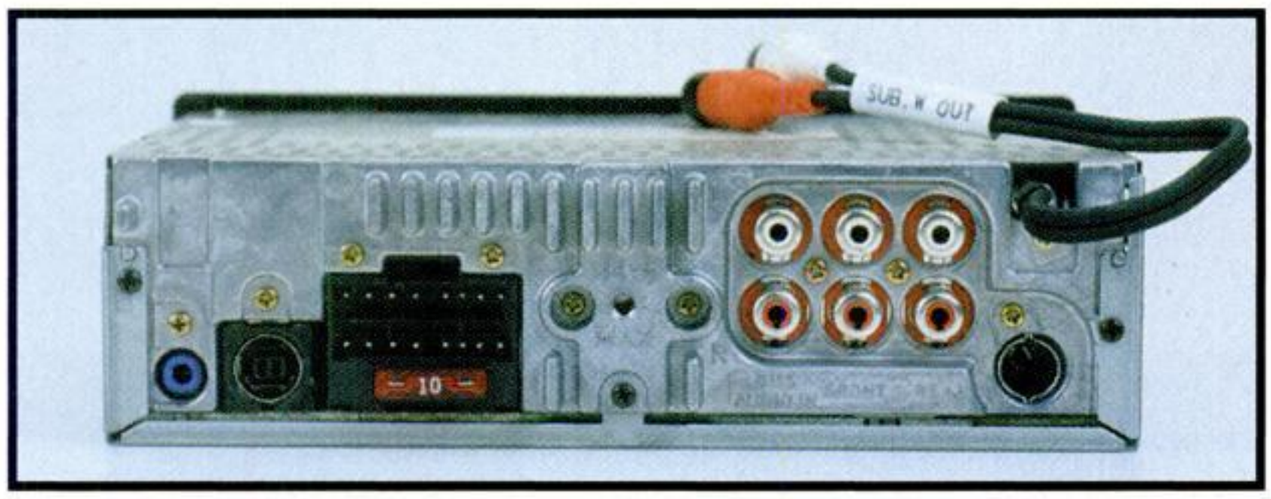
10 Get Someone Else to Put It in Your Car

At *Maximum PC*, we know our limitations. We may be authorities on building and tweaking PCs, but we're a little out of our league when it comes to properly installing audio components into a car. Sure, we can tell you how to run power to the 12V screw block on the back of the MP3 box, but rewiring your car's electrical system is definitely a job for a professional. Of course, a cigarette lighter power converter could get you up and running temporarily, but if you really want it done right, take it to a car stereo shop.

Professionals will make sure that the audio-out from your soundcard is correctly connected to the audio-in of your car stereo. More important, they'll make sure that the MP3 box is mounted into your car in a way that doesn't allow it to move around. The best way to extend the life of the hard drive (and the MP3s on it) is to have the box professionally mounted. If you install the box yourself, don't hassle us about damage you do to your car or your MP3s.

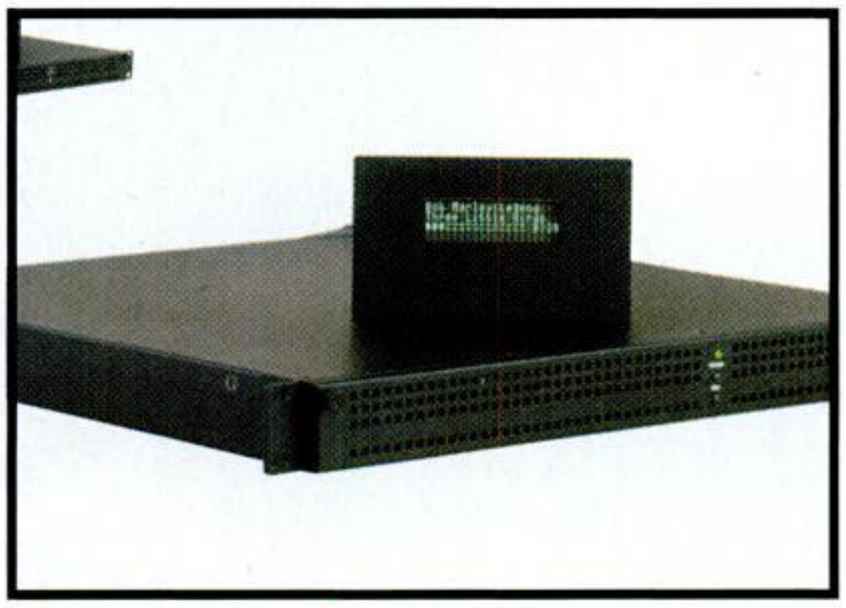
You can temporarily power your MP3 box through a cigarette lighter adapter, but eventually you'll need to get a car stereo shop to wire a more permanent connection.



If your car stereo sports audio input jacks, like the one above, you can run the audio directly from the MP3 box to the back of your stereo. If it doesn't have the correct jacks, you can either spend some quality time at the car stereo shop or use a cassette adapter.

11 Future Upgrades

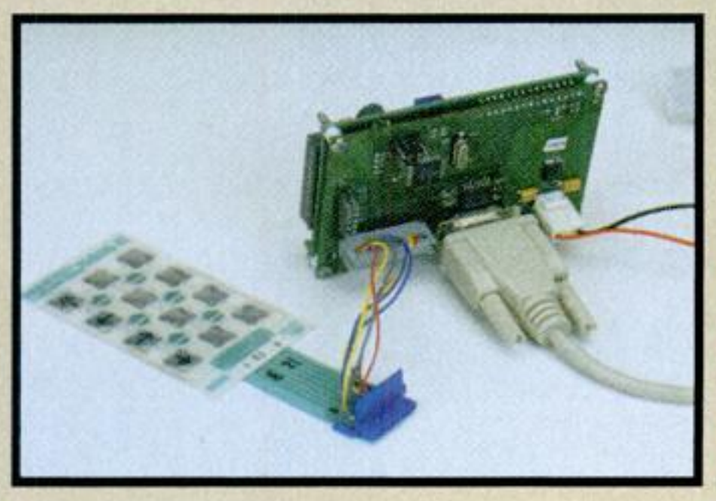
The beauty of building an MP3 box yourself is that you can upgrade it as necessary. If you manage to fill the hard drive or need a new soundcard, it's easy to swap out old parts. Just remember that a lot of thought went into the parts we picked, so if you plan to do things differently, consider the size, heat, and power constraints involved in sticking a PC in your car.



Once you have the MP3 box humming away under your seat or in your trunk, you'll never have to listen to inane radio banter or another cruddy old cassette tape ever again.

hit the power switch. Does it work? Good.

The VFD module is housed in a drive bay insert that holds the display in place with four screws and has enough space on the front for the membrane keypad. While the 12-key membrane keypad that comes with the VFD module works just fine, you only need four keys in order to run the MP3 box. At press time, Anders was experimenting with another keypad system, so check out **www.maximumpc.com/route66** for the latest on the new keypad setup.



The VFD module has three connections on the back: one for power, one for serial communications, and one for the keypad. Since the display will be sitting somewhere on your dashboard, be sure the serial cable and power line are long enough to reach between the MP3 box and the dash.

The Brownworth Project

I designed the *Route66* software to keep track of all the important information about MP3s—not only the ID3 information (song, artist, album, genre) for each song, but also each track's preferred volume setting. I wanted the ability to set preferences on a per-track basis, so that the MP3 box would play more of the music I like and less of the music I don't. To do this, *Route66* uses dynamic playlists that grow as you add new music that fits their criteria. For instance, if you define a playlist in *Route66* to include all songs by the band Radiohead and you then add more Radiohead tunes to the database, the new music will automatically show up in your pre-defined sets. All of this is changeable on the fly, because it's unlikely that people will want to set preferences on each of 5,000 tracks when they first fill their database.

The core of *Route66* is a Perl program that uses DBD and DBI to talk to a mySQL database. A good amount of software setup is needed in order to get *Route66* to work. Essentially, you will need Linux, Perl, DBD, DBI, a database such as mySQL, and a pile of MP3s. Don't sweat it if you're a Linux novice. Just go to www.maximumpc.com/route66 for a step-by-step how-to on installing the software and links to every software component you'll need. As the project expands, more features will be added, so stay tuned.

—Anders Brownworth

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PIXELI

PHOTOGRAPHY BY JACK HUTCHESON

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CIOUS

THE BEST DIGITAL CAMERAS ARE TASTIER THAN EVER

by Brad Dosland

We'll no longer try to convince you that digital is the only way to go when buying your next camera. Digital images can be e-mailed on the fly; immediately manipulated without waiting for processing, printing, and scanning; and filed into image databases for instant sorting and slideshows (no more shoeboxes of yellowing prints!). If you can't grasp the inherent advantages of the digital imaging revolution, you're hopeless. Just keep churning your butter and listening to that AM radio. The rest of us are going to bask in the red-hot glow of the latest digital cameras to push the envelope.

Features such as 2+ megapixel CCDs, external flash, audio capture, and uncompressed files for flawless image quality have become common. It really is a great time to be a silicon-based shutterbug. In fact, this year's models are so solid, the hardest thing about taking the plunge and mothballing that film-based dinosaur is deciding which new camera is right for you. In our previous digital camera shoot-outs, there have always been a few dogs in the crowd (actually, comparing some of those so-called cameras to dogs is a disservice to our canine companions). But this year doesn't have a bowser in the bunch.

Unfortunately, prices have not dropped for new releases. This year's graduating class sports some of the burliest price tags we've ever seen. Dollar-for-dollar, these cameras have a long way to go before catching up with their analog cousins on the pricing front. For example, Olympus's IS-20 film camera sells for $370, while the nearly identical Olympus reviewed in this shoot-out sells for $1,372. But that's the premium you have to pay for a state-of-the-art digital camera today.

We have to note that these cameras aren't your only choices when it comes to capturing your world in RGB. Previous years' Kick Ass award winners—such as Kodak's DC260, which now sells for a mere $500—are still widely available, and make excellent choices for the cost-conscious. Just beware of moldy inventory; many digital cameras sitting on store shelves are painfully ancient. These old jalopies don't offer the performance levels that you should expect in a good digital camera, and are rarely priced to take this into account. Frequently, a digital camera that sold for $500 three years ago will still be selling for a meaty chunk of that original price—this despite the fact that it comes with entirely substandard features (no *Maximum PC* editor would be caught dead with a camera limited to 640x480 resolution, or any camera lacking LCD playback, flash, optical zoom, and removable media support). When shopping for a digital camera, make sure you do your research and stick to the photography name brands you know.

In addition to 2+ megapixel resolutions and the must-have features mentioned above, the best new trend in digital cameras is radically superior design. The reality is that you're going to be using your camera in the real world, which is notoriously unforgiving. So why have so many past cameras been made of slippery-slick materials? And why haven't they offered discernible handles? Considering how much these cameras cost, you shouldn't be expected to place much trust in a flimsy wrist strap.

Thankfully, all the cameras in this year's shootout feature much more ergonomic designs, which makes taking the camera to the action much less risky. In fact, all of these cameras (except the throwback Kodak) employ a great grip-based design reminiscent of traditional, pro-caliber SLRs.

But enough talk. These pictures are worth a thousand words.

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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live on the web!

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FamilyPC Review Score Recommended

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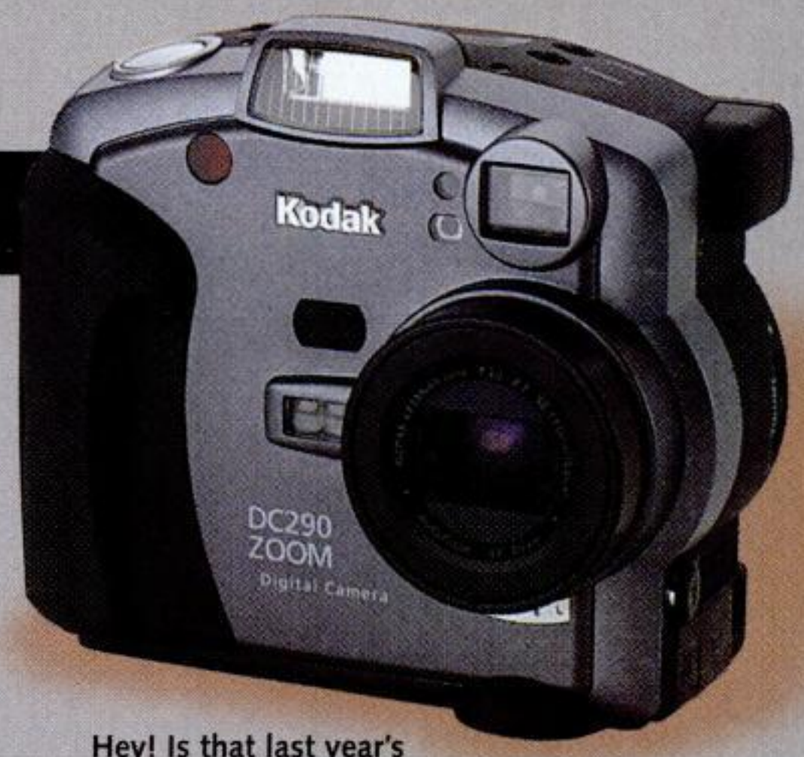
KODAK DC290



Hey! Is that last year's Camera of the Year? Nope! Meet the "new" Kodak.

As the reigning champion of digital cameras, Kodak didn't stray far from its successful formula. At first blush, you may even have a hard time telling the new DC290 from the older DC265.

But given the strengths of the DC265, this ain't such a bad thing.

Under an exceptionally ergonomic and intuitive shell beats the heart of a great camera. The old 1.6mp resolution has been cranked up to 2.1mp, taking files up from an already ample 1536x1024 to a hearty 1792x1200 (with interpolation, images up to 2240x1500 are possible but not recommended.) Of course, the best image quality comes from the natural resolution in uncompressed mode, which is now available without Digita macro scripting.

PLUSES
- Everything that made the DC265 great
- 2.1mp resolution
- 20MB CF card

MINUSES
- Not enough new features
- Still needs a better LCD preview

Digita scripting has been part of the Kodak line for some time. The feature allows shooters to create macros that perform a sequence of events with the touch of a button, complete with prompts on the camera's preview LCD. As the library of inventive scripts grows, this feature is rapidly becoming a significant checklist item for all digital cameras. In addition to image manipulation (see the DigitaFX review on page 63), Digita support also enables assorted creative tools ranging from an optical tape measure that employs the camera's focusing mechanism, to an addictive jigsaw puzzle game that uses your own images—and drains precious battery life like nobody's business.

Also present and accounted for is Kodak's über-friendly interface and on-screen display, which makes the camera's manual all but unnecessary.

Perhaps the biggest disappointment with the DC290 is that the minds who created last year's Camera of the Year didn't surprise us with an equally exciting new design. While that may be an unrealistic expectation, we still feel somewhat let-down. Nonetheless, any sequel that adds a cranked up CCD, a 20MB CompactFlash card, and a nifty rubberized casing for improved grip is hardly worth complaining about. But we still look forward to next year's Kamera. Maybe we'll get FireWire to go with that USB interface.

MAXIMUM PC VERDICT

Price $1,000
Company Kodak
Phone 800.235.6325
URL www.kodak.com

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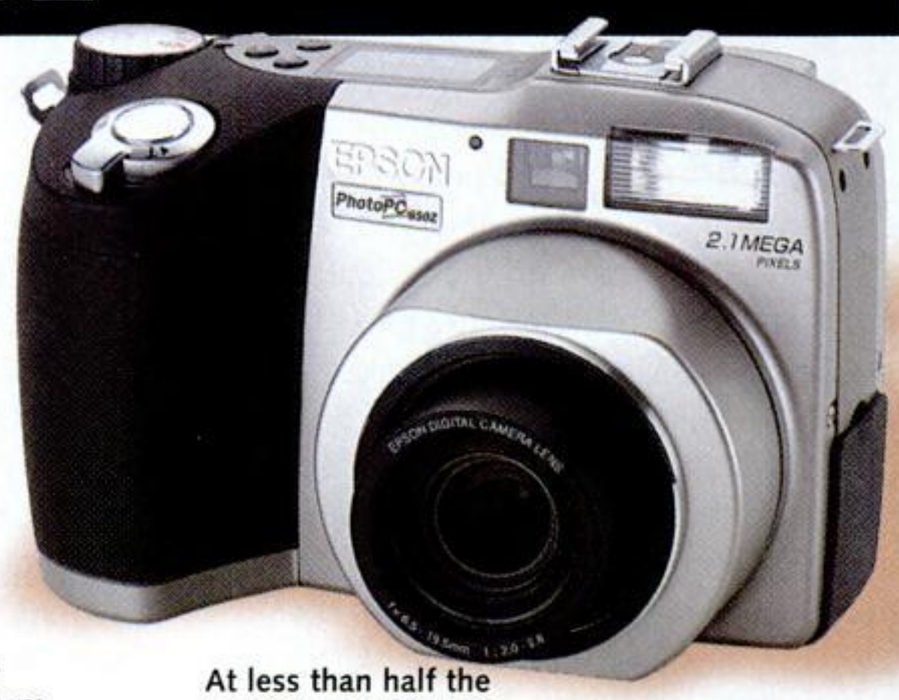
EPSON PHOTOPC 850Z



At less than half the price of Olympus' Kick Ass camera, the feature-rich 850Z is surprisingly hearty.

Epson has been a long-time contender in the digital camera game, but its new 850Z is really the company's first true playa. With a competitive 2.1mp CCD, a hot shoe for syncing off-camera flash, and audio capture, the 850Z delivers major-league features at a minor-league price.

A lot of attention to detail went into the 850Z. From a USB connector (for speedy image transfers) to a diopter dial (for adjusting the viewfinder for eyeglass wearers), the 850Z is impressive. Another nice feature is the inclusion of a sunlight-assisted LCD. By opening a small trap door above the 2-inch LCD playback screen, direct ambient illumination provides a back light for the display. You'll immediately grasp how important this is if you've ever had your LCD obscured by sun rays. Sadly, you won't find this feature in any other camera reviewed this month.

PLUSES
- Great Price
- USB port
- Hot shoe flash adapter
- Audio capture
- Sun-assisted LCD

MINUSES
- HyPict interpolation
- Meager 8MB card
- Bulky

In addition to a clever shutter that protects the lens and automatically retracts at power up, the 850Z comes with a sturdy threaded lens mount. This means that, like the Olympus (which costs more than twice as much), the 850Z can use standard lens attachments and filters without clumsy proprietary adapters.

Epson made the right call by opting for CompactFlash as the removable media of choice. Unfortunately, only a meager 8MB card comes with the camera. For cameras over 2mp, the minimum bundled CompactFlash capacity should be 16MB, given the large sizes of megapixel files. After buying any digital camera, your first investment should be a massive CompactFlash card (at least 64MB) to take into the field.

Some of the 850Z's "features" are actually traps. The camera does capture 1600x1200 images, but beware of the HyPict setting and its claim to deliver 1984x1488. These images are interpolated, and any upward interpolation introduces artifacts and softens image quality. Another faux feature common to digital cameras (especially digital video cameras) is "digital zoom." Don't mistake this for 3x optical zoom, which employs sophisticated lenses to accomplish magic. Digital zoom, as employed in the 850Z, essentially zooms in on a portion of your image and uses interpolation to blow the crop up to "full size."

Epson has come a long way, despite the fact that this camera includes some features that are best left untouched.

MAXIMUM PC VERDICT

Price $646
Company Epson
Phone 800.463.7766
URL www.epson.com

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FUJIFILM MX2900 ZOOM

One camera has to come in last, and this year's straggler is FujiFilm's MX2900 Zoom. Rife with niggling complications, the camera's strong features are negated by its general mediocrity. Strengths? How about a robust 2.3mp CCD that pulls down 1800x1200 images. A hot shoe for off-camera flash is also a nice touch. And any optical zoom is appreciated. But things go downhill from this point on.

PLUSES
- 2.3mp CCD
- Hot shoe flash adapter

MINUSES
- SmartMedia limitations
- Pricey for it's class
- .5x less zoom than other cameras
- Li-Ion battery hassle
- Slow write times

Let's start with the SmartMedia. We won't beat a dead horse; suffice to say, its limitations are well-known. Then there's the Li-Ion battery. While blessed with long life and near-infinite rechargeablity, specialty batteries such as this have a dark side: You won't be able to find them at Walgreen's when you need replacements out in the field. AA batteries may not be sexy, but at least you can buy 'em at any corner store during emergencies.

Bad design decisions don't stop here, though. The placement of the awkwardly shaped telephoto control is problematic at best. And while it's great that FujiFilm provided a lens cap, getting it on and off proved frustrating at times.

Combined with long boot up and write times, the MX2900 Zoom is an albatross with a price that exceeds its value.

Any other year, the MX2900 Zoom would have been a contender.

MAXIMUM PC VERDICT

Price $899
Company FujiFilm
Phone 800.659.3854
URL www.fujifilm.com

6

OLYMPUS 2500L

MAXIMUM PC KICK ASS! product

Before the era of Kodak's DC260 series, another beast ruled the digital camera landscape. Olympus's D-620L took primitive point-and-shoot specimens to their next evolutionary level, introducing traditional SLR styling and features.

The 2500L cranks up the D-620L's original design to the nth degree, offering a 2.5mp CCD for some of the most detailed pictures available from a prosumer camera. Other updates include a dedicated flash for the camera's hot shoe connector, and telephoto and wide-angle lenses that screw into the threaded lens mount. Altogether, the 2500L is a true digital camera system. It even overcomes the Olympus line's biggest historical downfall: SmartMedia.

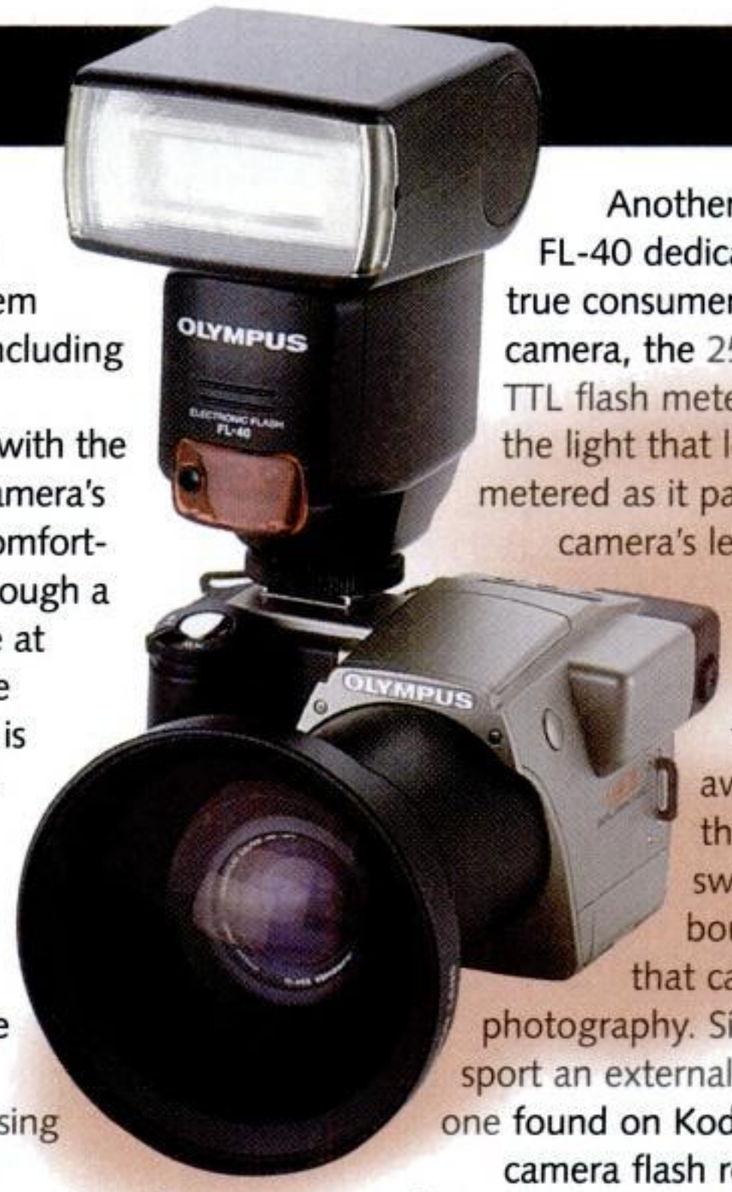
PLUSES
- Bold and beautiful lens
- Both SmartMedia *and* CompactFlash support
- Awesome add-ons
- Hotshoe flash sync
- Infrared focusing
- Improved labeling

MINUSES
- Pricey
- Tad heavy
- USB connector would be a plus
- Needs a sync port

When all things were equal, we liked SmartMedia as much as the next memory standard. But when the format failed to keep pace, we blacklisted it in favor of the more robust CompactFlash format. Olympus has steadfastly stood by its memory choice, but has solved the problem with the 2500L by including both formats.

Actually shooting with the 2500L is a joy. The camera's SLResque design is comfortable in the hand, although a tad on the heavy side at nearly 20 ounces. The extended lens design is great for steady two-handed shooting. The ample memory buffer allows for burst shooting (up to five frames in three seconds), and the infrared-assisted focusing works in near-total darkness (much like Kodak's similar system).

The new 0.8x wide-angle lens is a godsend. In many shooting situations, you'll find your back literally against the wall, making it impossible to step backward in order to get an entire picture. For this very reason, most photojournalists will only carry a wide-angle lens if they are limited to carrying a single lens. Wide-angle lenses are much more useful than telephoto lenses, and Olympus's offering is a masterpiece in glass.



The Olympus 2500L is a hot shoe-in for Best Camera with its excellent supporting cast.

Another must-have is Olympus's FL-40 dedicated flash. As the only true consumer-grade TTL digital camera, the 2500L takes advantage of TTL flash metering. This means that the light that leaves the flash is metered as it passes through the camera's lens, fostering more precise exposures. In addition to reducing red-eye by placing the flash source further away from the lens axis, the FL-40 has full tilt-and-swivel for sophisticated bounce flash techniques that can transform your digital photography. Since the 2500L doesn't sport an external sync port (such as the one found on Kodak's cameras), off-camera flash requires an optional hot shoe adapter. While this works, it's a hassle, and something for Olympus to fix the next go 'round.

The 2500L is certainly an early front runner for *Maximum PC*'s Camera of the Year. Check back in December to see if any challengers have one-upped it.

MAXIMUM PC VERDICT

Price $1,372
Company Olympus
Phone 800.347.4027
URL www.olympusamerica.com

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HEAD-TO-HEAD SHOOTOUT

▶ FILM

Image quality is certainly the defining factor for any digital camera, but the uniformly strong output from this year's tight field won't make buying decisions any easier. In a photo finish, we give the nod to the **Kodak DC290**'s combination of accuracy and richness. The **Olympus 2500L**'s image is bright and pleasing, although the big glass lens may have caught some flare from our lighting set up. With sharp, smooth images, the **Epson 850Z** was a surprise favorite with our judges, although a cast (easily removed in an image-editing app) mars its perfection. Pulling up the rear is the **FujiFilm MX2900 Zoom**. While its images are certainly nothing to be embarrassed about, they were noticeably softer in detail than others in this shoot-out, and some splotches were visible in color transitions.

▶ FUJIFILM MX2900 ZOOM

▶ KODAK DC290

▶ OLYMPUS 2500L

▶ EPSON PHOTOPC 850Z

PHOTOSHOP JR?

▶ DIGITAFX BRING FILTERS ONBOARD

If you have a Digita-enabled camera, you should seriously consider *Digita FX*. At this price, it's definitely worth a go.

Digita is an "operating environment" that augments traditional camera interfaces with fancy scripting and application support. Loading *DigitaFX* into a Digita-ready camera is like installing a junior version of *Photoshop*. In addition to simple image adjustments—including

brightness, contrast, color saturation, hue shifting, and image rotations—you get more complex functions, such as unsharp mask and gaussian blur.

Unfortunately, there's no lasso tool on a digital camera, so the latter is somewhat useless.

In addition to practical effects, *DigitaFX* also performs more gimmicky alterations, such as emboss, pixellate, mosaic, water color, and stucco effects. While you probably won't use these every day (in fact, we'd like to forbid it), they can be fun to apply to a title screen if you're using your camera's video-out to create on-the-fly slide shows.

While much of the program's functionality is dictated by the tiny LCD screen you must work on (who wants to apply a dramatic filter to an image based on a 2-inch preview?), the FlashPoint people have made the most of what they have to work with. The interface is exceptionally elegant and intuitive, and the program runs surprisingly swift, given the limitations of the platform. The program does chew up nearly a megabyte of your removable storage (and can't be deleted during a storage emergency), but it's worth the real estate... if only for the bragging rights.

MAXIMUM PC VERDICT

Price $20
Company FlashPoint
Phone 888.820.3644
URL www.flashpoint.com

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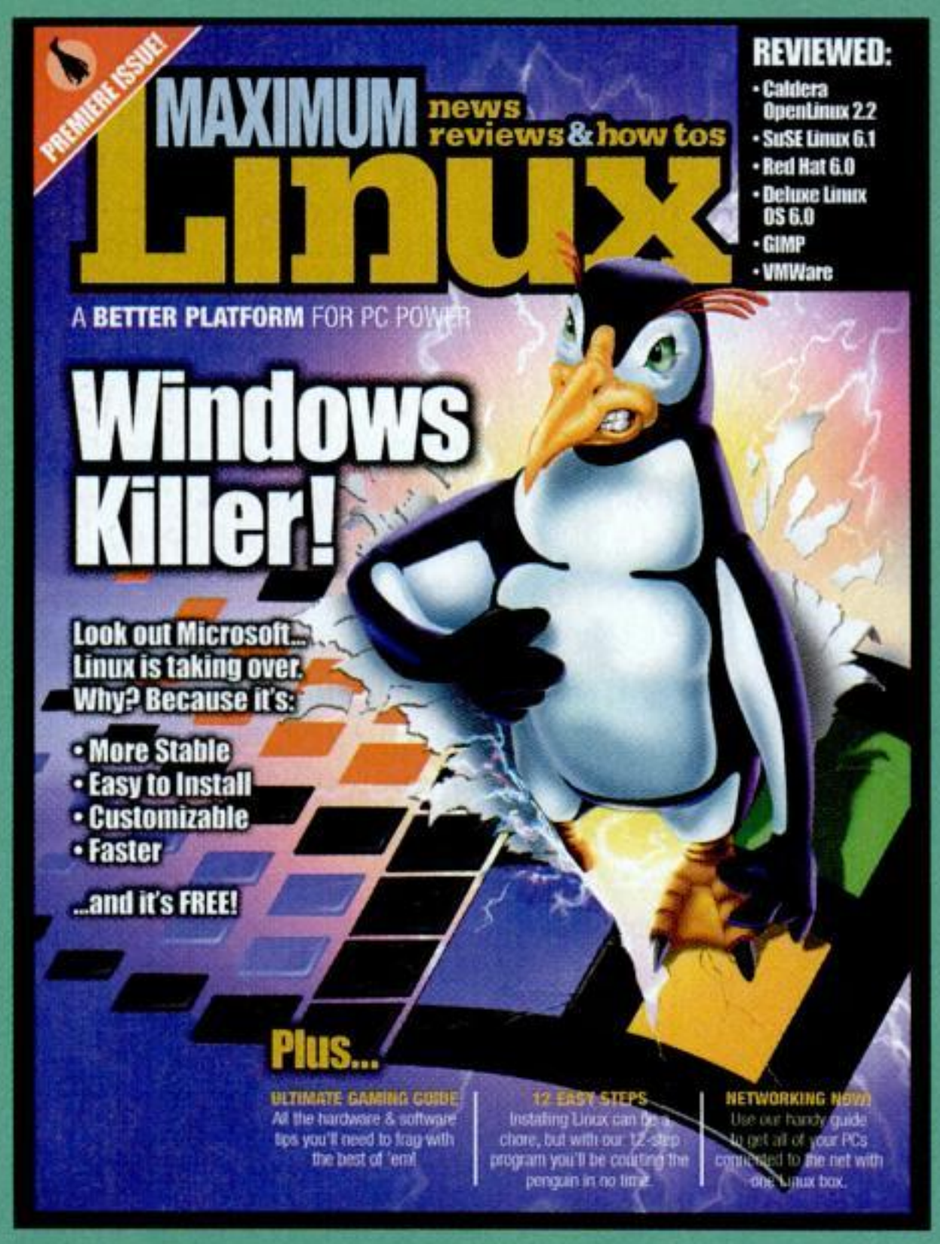
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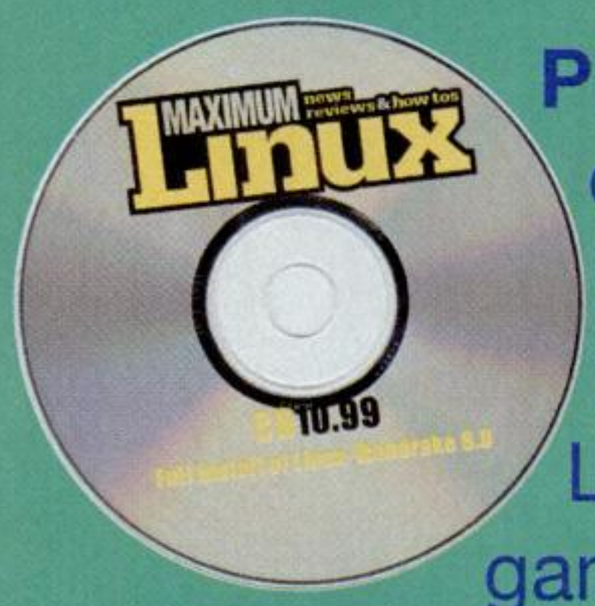

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THE SECRETS TO SNAPPING BETTER DIGITAL PICS

If you want better digital images, you have to embrace the tried-and-true principles of traditional film photography: lighting, composition, and moment.

What constitutes the "right" light? The oldest rule of thumb is to shoot with the sun behind you. While this does produce evenly exposed images, digital cameras can be more susceptible to the hot spots that this technique can inflict on light-colored objects. This technique also tends to produce a lot of squinting, as your subjects will shield their eyes and keep asking, "Are you ready yet?"

A better variation involves getting out of the direct sun and shooting in what the pros call "open shade." This can be as simple as standing beneath a tree or in the shade of a building. This kind of light can be particularly flattering next to a neutral-colored building. Just beware that this lighting can create a blue cast, which many digital cameras amplify. Still, color shifts can easily be corrected on your PC.

Even better light can be found by going indoors and finding a big window to park your subjects alongside. Don't shoot directly into the window, unless you really want a silhouette. Instead, rotate over 90 degrees so that the soft window light lands on the side of your subject. This set-up convincingly simulates expensive studio softbox lighting.

While modern digital cameras have much better light sensitivity than their predecessors, all CCDs struggle in low light. Auto-focus fails, colors fade, and the temptation to use the on-camera flash grows strong. Resist. And if you can't resist the flash, get away from the wall. Far away. A tell-tale shadow that rims flashed subjects screams amateur. And if you're using the flash outdoors at night, know this: It won't work much beyond 10 feet, so quit using it to take pictures at football games.

When it comes to composition, you should resist the instinct to use the camera as a sniper scope, framing your subject dead center. Besides the mysterious empty space this puts above your subject, this approach tends to produce images that fail to surprise. Instead, use the "Rule of Thirds," focusing your key subject matter in either the top-, bottom-, right-, or left-third of your viewfinder.

Also, when taking a picture of friends in front of a key monument, don't have them stand directly in front of it. Instead, split the distance, moving your subjects toward the camera. You want to see their smiling faces, so put the background over their shoulders.

When it comes to capturing the moment, smiling faces are frequently the problem. Resist the urge to stop the moment that inspired you to take the picture in the first place, because when you ask everyone to say cheese, that's all you'll get: cheesy snapshots. Instead, shoot whatever's actually happening and let the moment carry the picture. You may have to patiently wait for people to overcome their insane-grin reflex, but it'll pay off. Once you're willing to *wait* for the moment, you'll get better pictures.

It's also important to anticipate the moment by sensing the flow of the action (this is especially important with digital cameras, which can require time to focus and fire). If you're shooting a sporting event, learn to anticipate peak moments.

Try any of these techniques, and you'll be rewarded with much better pictures.

	Resolution	Media	Zoom	Flash	Price	Verdict	Extras
Kodak DC290	2.1 mp	CF (20MB)	3x	built-in +sync	$1,000	9	audio, USB, Digita
Olympus 2500L	2.5mp	CF/SM (32MB)	3x	built-in +shoe	$1,372	9/KA	43mm mount, excellent add-ons
Epson PhotoPC 850Z	2.1mp	CF (8MB)	3x	built-in +shoe	$646	8	audio, USB, mount, sun-assist LCD
FujiFilm MX2900	2.3mp	SM (8MB)	2.5x	built-in +shoe	$899	6	Li-Ion battery, proprietary mount

DARE TO COMPARE

So which camera should you buy? Tough decision. With image quality so consistently great across the board, you must turn to features and price to make your call this year. If you've got the ducats, go with the mighty **Olympus 2500L** system. And don't skimp on the extras; buying the camera without the flash and wide-angle lens is a waste. If you don't have a couple grand to drop, seriously consider the **Kodak DC290**. Kodak has only added to a great camera, and you can't go wrong with this choice. If you're on a budget, consider the **Epson 850Z**. While not as burly as our two top picks, this camera should serve capably. Sorry, but we just can't recommend the **FujiFilm MX2900 Zoom** under any circumstance in this unusually tough field.

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RAM-o-Rama!

YOUR FIELD GUIDE TO MEMORY TYPES

Extra memory never hurt, but not all bytes are created equal. New memory technologies can be integral to the performance of a new CPU architecture, and a different flavor of RAM can turn an average graphics card into a screamer. A thorough understanding of memory is essential if you want to make smart upgrading decisions, so here's what you need to know.

—Chris Dunphy

FEED THE STARVING

At one time, CPU and memory speeds ran neck-and-neck, but once CPUs crossed the 66MHz barrier, they left memory in the dust. Bus multipliers such as 1.5x, 3.0x, and 4.5x describe not only how fast new CPUs run, but also how many times processor development has lapped memory speeds. Currently, the fastest CPUs are running up to 8x faster than the main memory on which they rely for data nourishment. It's little wonder that modern CPUs are starving for more data to process.

Ideally, your processor would be served by infinite amounts of infinitely fast memory. Unfortunately, this proves to be infinitely expensive. To balance the three-way tradeoff among price, quantity, and speed, system architects have taken a multi-tiered approach. They begin with a tiny amount of extremely fast and expensive memory in the heart of the CPU, add a larger amount of slower and less expensive memory as L1 cache, and keep going in this direction until they reach the amazingly cheap and astoundingly slow "virtual memory" stored on your hard drive.

Deep inside your CPU lurks the fastest memory of all: your processor's registers. A typical CPU has only a few dozen of these beasts, and each one is able to store just a single value. These registers are directly wired into the brain of your CPU, and only data stored in the registers can be manipulated at the CPU's maximum raw speed. Whenever the CPU needs to crunch a number that's not already in a register, a memory request is generated and the CPU's internal memory controller goes to work. This is when things get interesting.

Modern CPUs support out-of-order execution, and often have multiple internal execution pipelines, so the CPU can get some work done while it waits for incoming fodder. But if the memory controller can't quickly find the bits that the CPU needs, the processor grinds to a halt with nothing left to do. Fortunately, the memory controller rarely has to tap "slow" main memory to find the fodder the CPU needs. For this, you can thank the miracle of PC architecture known as cache.

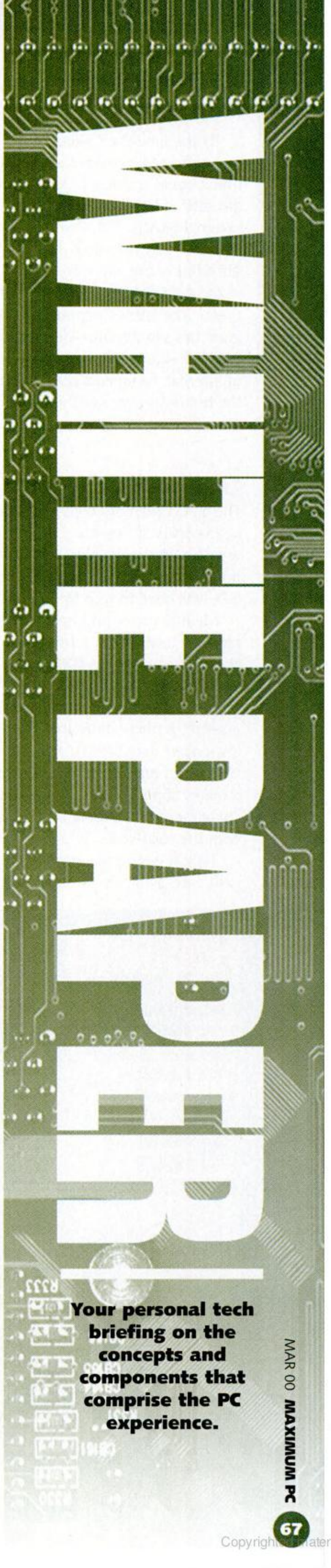
The blue metal shield on this Rambus module acts as a heatsink and RF shield.

CACHE ME IF YOU CAN

All modern CPUs try to crunch a constant stream of instructions by throwing some Level One (L1) cache into the mix. The L1 cache is generally a tiny amount of static RAM (SRAM) physically integrated into the CPU silicon itself; it runs at the same speed as the CPU. Data can be moved from L1 cache into a register in as little as one tick of the CPU's clock, hardly slowing things down at all. But because the L1 cache is so closely tied to the CPU registers, it's very expensive and there isn't room for very much of it. So rather than give up and wait for main memory, the memory controller turns to L2 cache.

L2 cache is made of the same expensive SRAM as the L1, but because it's not so tightly wired to the brains of the CPU, it's cheap enough to use more of it. In older systems, the L2 cache sat on the same slow external bus as the main memory (remember cache sticks?). This external cache could answer data requests much faster than main memory could, but was severely limited by the shared system bus. This was fine in the days of 200MHz processors on 66MHz busses, but proved just too damn slow for anything faster.

To solve this, the Pentium Pro introduced the concept of a separate cache bus. This separate bus segregated the cache from main memory, and allowed the fast SRAM L2 cache to talk to the CPU at one speed, while the slower system bus ran at another. The Pentium II, III, and Athlon all provide a sizable 512K of L2 cache running at half the processor's core speed (which is still much faster than main memory).



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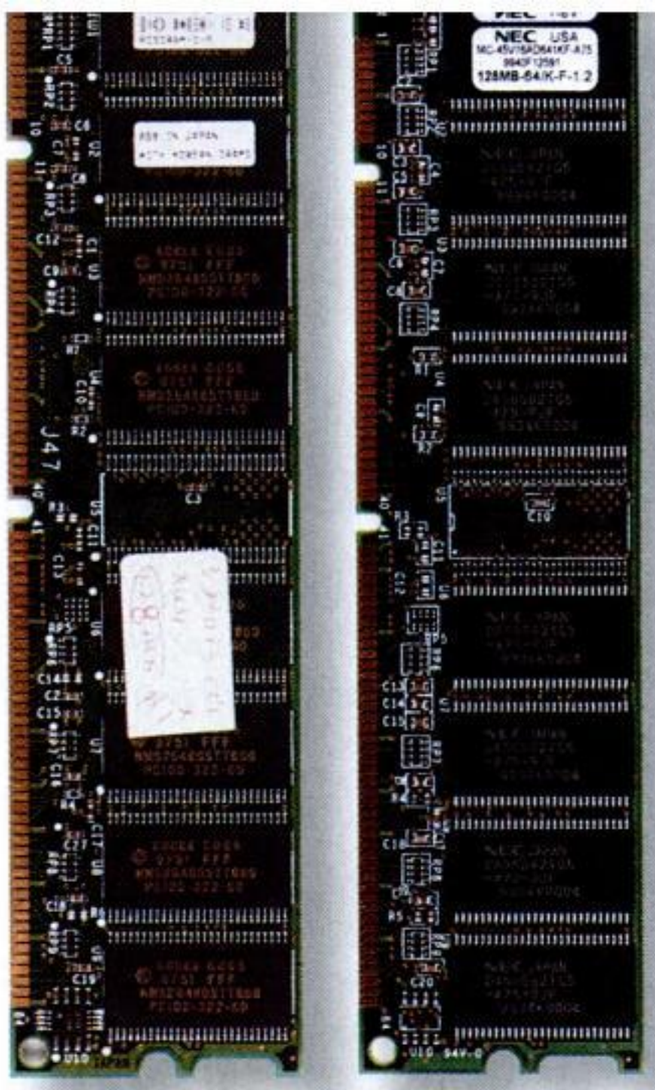
By the time the Celeron rolled around, Intel had perfected its manufacturing to the point that it could squeeze L2 cache on the processor die itself, ditching the expensive cartridge and external SRAM. The downside was that the Celerons only managed 128K of L2 cache. But since this cache was now internal, it could run at the full CPU clock speed, rather than half the speed. The latest Coppermine-based P-IIIs have gone this same route—dropping down from 512K of external, half-speed L2 cache to 256K of internal, full-speed SRAM-lovin. In all but the heftiest server benchmarks, the trade has proven worthwhile.

DYNAMIC DELIGHTS

The CPU's memory controller does its best to keep copies of necessary data stored somewhere in the cache hierarchy, but at some point, a "cache miss" is bound to occur and the CPU will have to turn to main memory to replenish itself.

Main memory isn't nearly as fast to access as cache, but it's certainly a winner in terms of price. Thanks to the proliferation of cheap dynamic RAM (DRAM), PCs with 128MB or more of main memory are now practical and affordable. The basic DRAM cell that serves as the foundation for all main memory technologies is, in essence, nothing more than a tiny battery. DRAM consumes a lot less power than SRAM, and, thanks to its small size, is dramatically cheaper to manufacture. But maintaining a charge in a DRAM cell requires continual refreshing, and reading and writing data (by charging or discharging the "battery") is inherently slower than with the solid-state, all transistor SRAM.

Typical word processing and web surfing can be handled with ease by any main memory system, but a new generation of multimedia is blowing away even the best cache schemes, so main memory performance suddenly matters more than ever. As a result, new technologies have emerged to satisfy your starving CPU's cries for bandwidth.



The PC100 DIMM on the left is the most common memory currently in use, but watch for more exotic memory technologies, such as the VC133 on the right, to replace it.

The current king of the memory hill is SDRAM. In its 66MHz and 100MHz flavors, SDRAM is found in nearly every PC made today. Also known as **Synchronous Dynamic Random Access Memory**, SDRAM has completely pushed aside the former memories of choice—**EDO** and **FPM**—because it's built to handle a faster bus and compliment highly clocked CPUs. Older EDO and FPM DRAM are non-synchronous, which means that the memory chips aren't tied to the speed of the system bus. But for roughly the same cost as older memory, SDRAM offers synchronized timing, and can easily run at 100MHz and beyond. Because older DRAM designs didn't have much headroom beyond 66MHz, SDRAM has ruled the roost for the last two years.

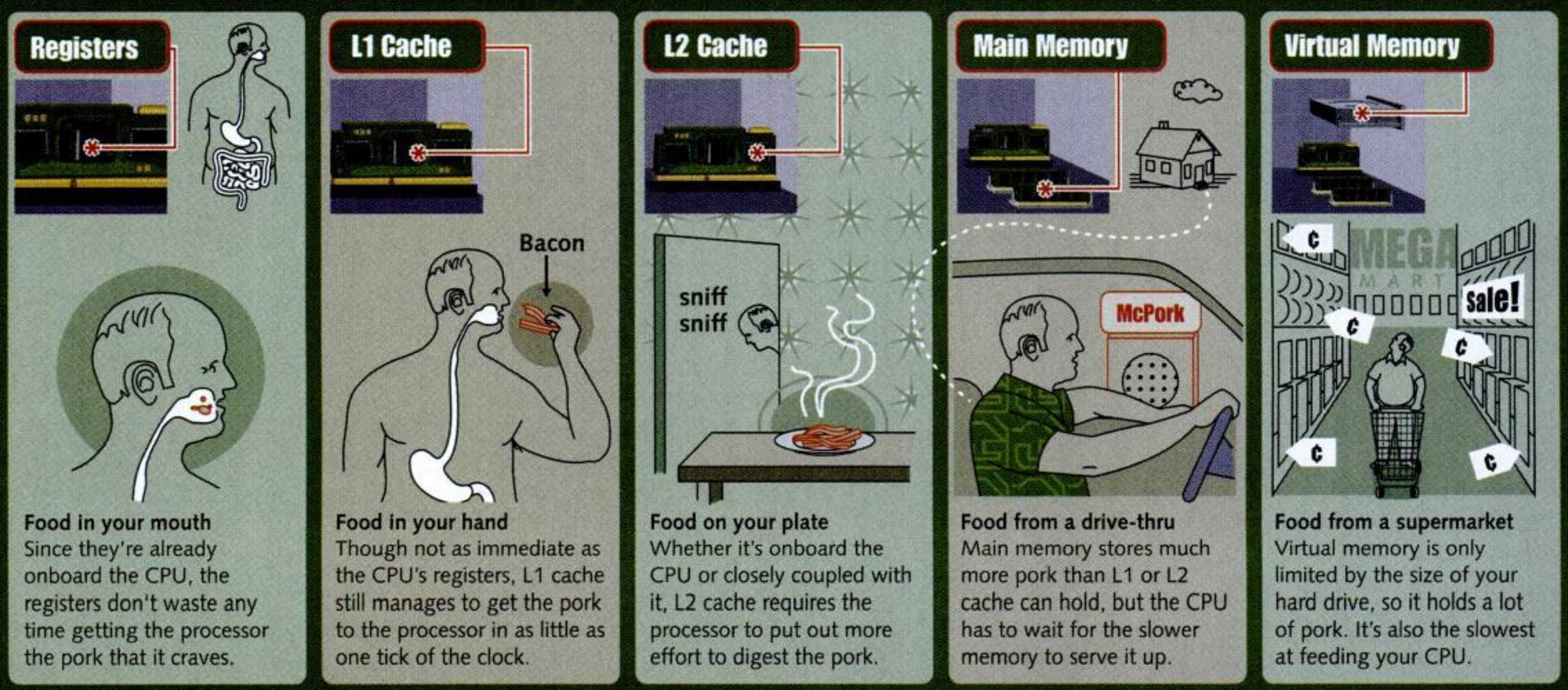
Beyond SDRAM, the next step in the evolution of main memory isn't nearly so obvious.

PC133 SDRAM

PC133 SDRAM is nothing fancy; just the same tried-and-true SDRAM clocked to 133MHz. It's not officially supported by most core-logic chipsets, but has become the overclocker's best friend. PC133 SDRAM is only slightly more costly than good PC100 memory, but remains 100% compatible with its slower brother. Make sure that any SDRAM you buy today is rated PC133. This gives you future upgrade options, not to mention extra headroom when overclocking.

Feeding a Hungry CPU

Your CPU has a high metabolism. It's always hungry for more data to process, which is why so much of your system is devoted to keeping it fed. You can think of the different memory levels that service your CPU in terms of how far away the potential nourishment is from the processor.



Food in your mouth
Since they're already onboard the CPU, the registers don't waste any time getting the processor the pork that it craves.

Food in your hand
Though not as immediate as the CPU's registers, L1 cache still manages to get the pork to the processor in as little as one tick of the clock.

Food on your plate
Whether it's onboard the CPU or closely coupled with it, L2 cache requires the processor to put out more effort to digest the pork.

Food from a drive-thru
Main memory stores much more pork than L1 or L2 cache can hold, but the CPU has to wait for the slower memory to serve it up.

Food from a supermarket
Virtual memory is only limited by the size of your hard drive, so it holds a lot of pork. It's also the slowest at feeding your CPU.

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Another thing to consider when picking your SDRAM is its CAS latency rating. The CAS latency will generally be either CL-2 or CL-3; the number indicates how many clock cycles the memory chip needs in order to prepare for another transaction. CL-2 chips have a slight performance edge, and are worth shopping around for.

Though 166MHz flavors of SDRAM are possible, the SDRAM architecture isn't capable of getting much faster without an overhaul. Tweaks such as ESDRAM, which permits faster burst speeds, might help extend the life of traditional SDRAM, but it's clear that something better is needed for the long term.

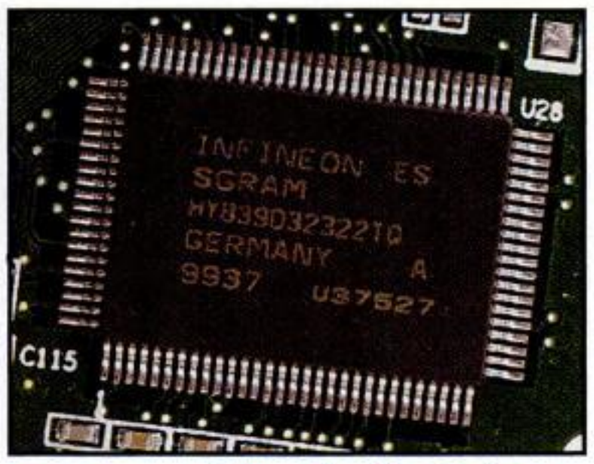
RAMBUS

Intel's chosen successor to SDRAM is Rambus DRAM (a.k.a. Direct RDRAM). RDRAM sends a narrow signal a short distance, at an insanely fast speed. Currently available RDRAM modules run with an awe-inspiring effective bandwidth of 800MHz, over a relatively narrow 16-bit bus. Because this small bus takes much less space to route on a motherboard than a traditional 64-bit bus takes, systems can get even more bandwidth by running two, four, or even more channels in parallel. With all these advantages, it's clear why Intel officially blessed RDRAM as its next-gen memory of choice—despite the reluctance of the rest of the memory industry to jump on the bandwagon.

Despite Intel's endorsement, RDRAM is having a tough time living up to the hype. Compatibility and timing issues that delayed the rollout of RDRAM systems have been solved, and problems with heat are easy to work around (Rambus RIMMs are the first memory modules to require heatsinks). But the real killer to the RDRAM dream is cost. Because RDRAM uses such a different memory interface, memory manufacturers face a sizable retooling cost to gear up their test and assembly facilities.

DDR SDRAM

Every memory manufacturer is supporting RDRAM, if only to make Intel happy. But off the record, most would prefer to see DDR SDRAM (dubbed PC200 and PC266) become the next memory of choice. DDR memory is the natural evolution of existing SDRAM designs, and as such, can take advantage of the existing assembly and test infrastructure. Also, DDR is an open industry standard that all memory manufacturers can build without having to pay for licensed designs from Rambus Inc. This means lower costs. DDR memory should eventually cost only slightly more than regular SDRAM, but for the same price, you get twice the speed.



DDR memory delivers double the data rate of SDR memory.

DDR stands for "double data rate." PC100 SDRAM and PC200 DDR memory both use the same 100MHz bus clock, but DDR gets tricky by shuffling data over the bus on both the rising and falling edge of the clock pulse—effectively doubling the raw speed by moving two bits per pulse instead of one. VIA, ALI, and Micron have already announced plans to move toward DDR memory instead of RDRAM in their core-logic chipsets, and Micron has even demonstrated a prototype DDR motherboard that outbenchmarks the fastest single-channel RDRAM systems.

RAM	Bus Width	Speed	Max Theoretical Bandwidth
PC100	64bits	100MHz	800MB/s
PC133	64bits	133MHz	1.1GB/s
RDRAM	16bits	400MHz x 2	1.6GB/s
PC200 DDR	64bits	100MHz x 2	1.6GB/s
PC266 DDR	64bits	133MHz x 2	2.1GB/s

Speed Strategies

If you're a memory designer itching to go faster, there are only a handful of ways to get there:

- **Go Faster:** The simplest way to crank up the speed of memory is to, well, just crank up the speed. Traditional SDRAM is being pushed up to 166MHz and beyond in some graphics applications.
- **Go Wider:** If you can't get the amount of data you want by speed alone, the next best thing is to widen the data bus and suck up twice as many bits at once. But you can only go so far. Pentium CPUs request 64 bits at a time, and some graphics controllers can handle as much as 128. But it becomes real tricky to wire up anything more complicated than this.
- **Go Twice:** It is electrically very difficult to handle a fast clock across a memory bus, but some engineers have figured out ways to keep the clock at a sane speed while moving data twice as fast: DDR allows memory chips to send data on both the rising and falling edge of a clock pulse, doubling the effective speed. A similar technique is used on the AGP bus to achieve 2x and 4x speeds.
- **Go Thin:** Rambus has taken a unique approach in designing its RDRAM memory: Make the channel only 16-bits wide, but clock it really, really fast. RDRAM typically runs at 800MHz (actually 400MHz, double-clocked), and can provide even more potential bandwidth if several Rambus channels are run in parallel.
- **Go Parallel:** If you can manage the complexity and cost of two (or more) memory systems, nothing beats the raw speed of doing things in parallel on multiple memory buses. This is sometimes done to create fast interleaved main memory for high-end servers. In the graphics arena, 3Dfx has proven to be a master of this game.
- **Go Inside:** The absolute ultimate in speed is to follow the path pioneered by Neomagic: Merge DRAM with logic to create a system with all the necessary memory internal to the chip. Bringing the memory inside gives two potentially huge advantages: cost and speed. System cost can be reduced because there is no need for external memory buses or complicated layout. And speed can conceivably go through the roof, because internal memory architectures don't face some of the constraints of external memory. A 2048-bit interface to memory seems insane externally, but it's do-able when everything's inside.

THE FUTURE

Intel and the memory industry have recently reached a truce, so it looks like we might avoid a standards war when the next generation of memory hits in 2003. For the next generation of RDRAM, Intel is working with Samsung, Micron, Hyundai, NEC, and Infineon to co-develop a standard. Though the designs are still in the back-of-a-napkin phase, it's also reasonable to expect small bits of SRAM to be integrated into ever-faster DDR or QDR (quad data rate) SDRAM, improving latency while simultaneously cranking clocks up to deliver more bandwidth. As for size, well, a gigabyte of main memory is probably a lot closer than you can imagine.

Chris Dunphy, founding technical editor of boot magazine, is now "making the world safe for Linux" at Eazel, Inc. Reach him at ***cmd@thematrix.com****.*

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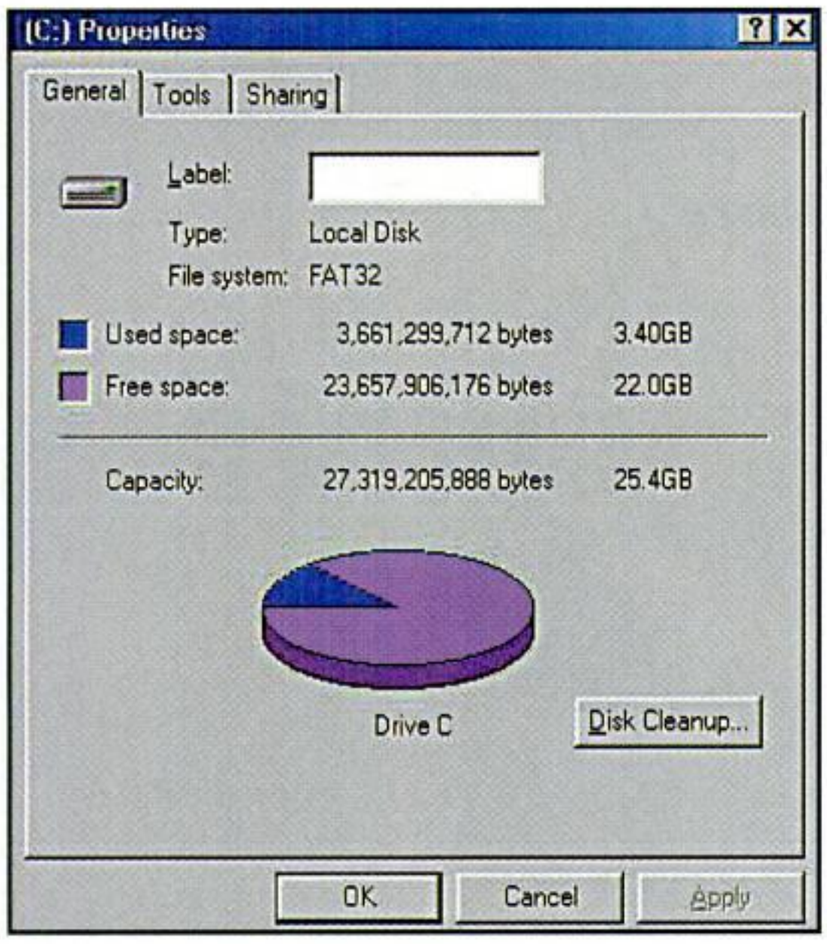
Symptom | Diagnosis | Cure

According to their boxes, today's computers are totally trouble-free, plug-and-play, and easy to use. Of course, in the real world, they can be about as easy to figure out as the opposite sex, and we want to help (with your PC, not your love life). If you're having trouble (once again, with your computer), send the details of your dilemma to **doctor@maximumpc.com**. Just remember that there are only 24 hours in a day, so we can't answer every question.

Drive size debunked

Why does Windows report varying hard drive sizes? When I click on My Computer and highlight the C drive, the figure 25.4GB is reported in the status



Windows reports capacity according to the notion that a MB is 1,048,576 bytes.

bar. But if I go into the BIOS, the drive is reported to be 27.3GB, and Windows' drive information states the same imbalance. What's up with that?

—Dom Valentino

The problem stems from the way hard drive vendors define a megabyte. There's the correct way, and there's the "cutting corners to advertise larger drive sizes" way. Most vendors determine drive size according to the dubious notion that a megabyte contains 1,000,000 bytes; after all, in scientific notation the letter "M" does indeed mean 1,000,000. In reality, however, a megabyte is 1024 kilobytes, and a single kilobyte is 1024 bytes. So, a megabyte is the product of 1024 multiplied by 1024: 1,048,576 bytes. Most hard drive vendors don't use this larger number, however. Instead, they use the "scientific notation" argument as a crutch, and round down to 1,000,000. This allows them to advertise larger drives capacities. See, if you claim that a MB is smaller than it really is, you can fit more MBs on your drive, and report a larger drive size. (All this despite the fact that the "M" should refer to megabytes; at *Maximum PC*, MB is the abbreviation for megabyte.) Sneaky, huh?

In your situation, the BIOS is simply reiterating whatever information the drive has been programmed to report. Windows, meanwhile, actually surveys drive capacity, and uses the 1,048,576 equation in its reports. Therefore, Windows will look at the drive and see it as being 5% smaller than what the BIOS and manufacturer claim.

Can ATA/33 and ATA/66 play nice?

Please help me settle this once and for all. I am currently in the market for a new hard drive, and the majority of online retailers I've contacted are selling ATA/66-based drives. Where did all the ATA/33 drives disappear to? What are the ramifications, if any, of using an ATA/66 drive in a system that only supports the ATA/33 spec? While contacting various companies directly, I've been told different things.

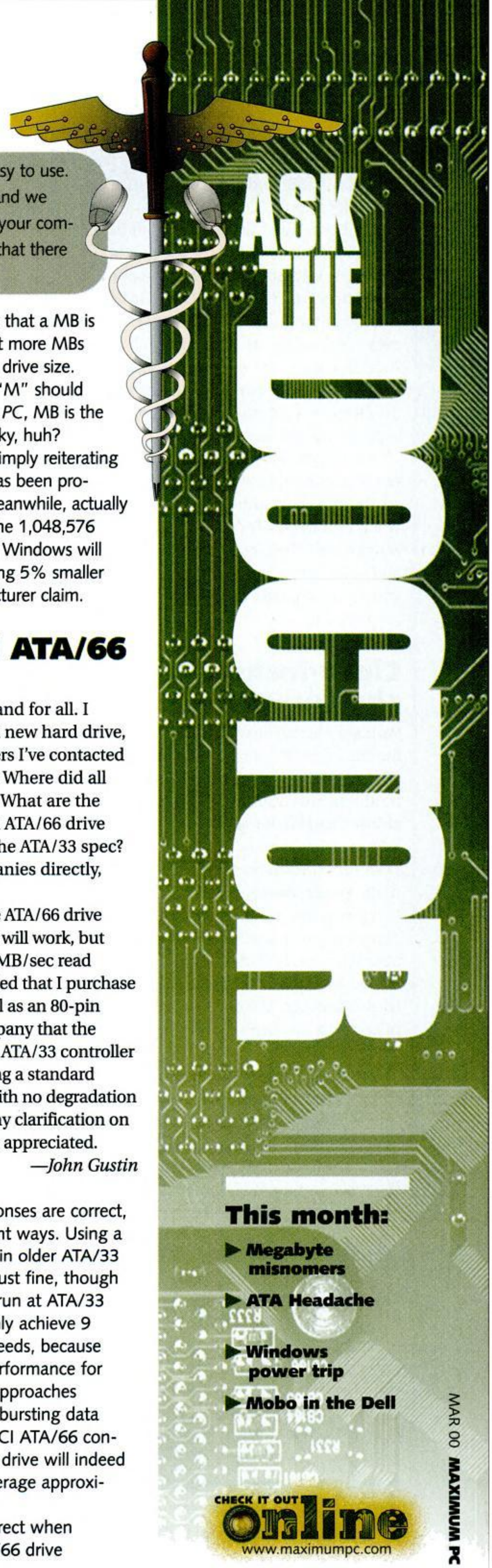
One vendor said installing the ATA/66 drive into a system supporting ATA/33 will work, but that I would only achieve 9 to 16MB/sec read speeds at best. They recommended that I purchase an ATA/66 controller card, as well as an 80-pin cable. I was told by another company that the ATA/66 hard drive will detect the ATA/33 controller and adjust itself accordingly, using a standard 40-pin IDE cable, with no degradation of performance. Any clarification on this issue would be appreciated.

—John Gustin

> **Using a new ATA/66 drive in older ATA/33 systems will work just fine.**

Both of those responses are correct, although in different ways. Using a new ATA/66 drive in older ATA/33 systems will work just fine, though the drive will only run at ATA/33 speeds. You will only achieve 9 to 16MB read speeds, because that's average performance for ATA/33 (it only approaches 33MB/sec when bursting data from cache). If you purchase a PCI ATA/66 controller and an 80-pin cable, your drive will indeed run at ATA/66 speeds, which average approximately 20MB/sec read speeds.

The second assumption is correct when it states that connecting an ATA/66 drive



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to an ATA/33 controller won't degrade performance—ATA/33 performance, that is. Full UDMA/66 mode requires an ATA/66 controller and an 80-pin conductor cable. This cable includes 80 wires instead of 40; the extra wires are used for grounding purposes. Without full ATA/66 support, you simply won't get the 50 to 63MB/sec throughput that an ATA/66 controller would deliver during bursts. Instead, you'll hit the ATA/33 ceiling (somewhere around 25 to 31MB/sec during bursts). CPU utilization may also be a bit lower with full ATA/66 support, but not by much.

We recommend using an 80-pin cable to connect both new and old drives to your motherboard or controller, regardless of whether they're ATA/66 or ATA/33. The 80-pin cables help eliminate cross-talk and noise across the bus, and also prime you for an upgrade to ATA/66.

Clock-locks and shut downs

Perhaps you can answer two questions for me. I recently purchased a Micron PC with a P-III 667MHz CPU, a Tyan S1854 motherboard running the VIA Apollo 133a chipset, and Win98 second edition: Do you know how I can turn off that portion of the Power Management that forces the computer to completely turn itself off after Windows is shut down? The second question relates to overclocking. The multiplier on my system is set to 5.0 on a 133MHz bus giving the CPU its 667MHz speed. However, I see that the multipliers on this motherboard go up to 7.0, indicating that with the proper cooling, the P-III could be taken to 931MHz. I've heard conflicting reports about the P-III's ability to be overclocked. I've read that some are "locked" into a clock frequency and can't be overclocked, and some are not. How do I know if mine is locked or not? I wouldn't mind a little bump to 798MHz by utilizing the 6.0 multiplier. What say you?

"How do I know if my CPU can or cannot be overclocked?"

—Dave Olshina

To get your PC into "safe to turn off your computer" mode, disable all advanced power management features in both the BIOS and in Windows. In the BIOS, go to the advanced power management screen and change the setting to "disabled." In the Win98 Control Panel, go to System Properties>Device Manager>System Device> Advanced Power Management. Click "disable in this hardware profile," and you'll be all set.

The label "Intel Confidential" on a P-III CPU means the unit is an engineering sample without a clock-multiplier lock. Retail CPUs are all supposed to be locked, though an occasional crackpot claims he has one that isn't.

As for your other query, you shouldn't be able to overclock your CPU to 800MHz because it should be clock-locked, meaning the 5.0 multiplier is set in the chip. Some people report that their P-III CPUs aren't clock-locked, but they're either lying or lucky, since a non-locked CPU showing up in retail is a verified anomaly. Still, we can believe that a few not-clock-locked ones slip through. If your CPU says "Intel confidential" on the casing, it's probably not locked.

The only way to overclock locked P-IIIs is to adjust the frontside bus speed. If your BIOS and motherboard allow bus speed increases, experiment with various settings in search of a stable speed. If they don't, download SoftFSB from **www.h-oda.com**, and adjust your FSB manually. But don't blame us if you burn your house down or ruin your PC.

second opinions

READERS SHARE THEIR HOME REMEDIES

Mobo-gate

I Read your answer to Charlie Elking's question in the Jan 2000 issue about putting a Soyo motherboard in his Dell XPS T450. I just wanted to pass along a word of caution regarding Dell's unique power supply connectors. While I have not seen a pinout for the XPS T450 PS connector, I would like to note that the layout is the same as on my XPS D266. There are two connectors: One resembles a standard ATX connector (designated POWER in the manual), and the other is a secondary 3.3V connector (designated 3.3V). On the XPS D series, the POWER connector resembles a standard ATX connector, but does not carry the same power signals in the same locations as the ATX connector. In fact, none of the 3.3V signals standard to the ATX power supply are carried on this connector—the secondary 3.3 connector carries them all.

I cannot say for certain that this is the case with the XPS T450, but it may be easy to check, since the Dell power supply appears to use the same color-coded wiring as a standard ATX power supply. Hence, for example, if the P1 connector that Mr. Elking mentions does not have three orange wires going to pins 1, 2, and 11, he may not be able to plug up his Soyo board to the power supply.

—Jim Lowther

Doh! The Doctor forgot the rule that explains why one should never assume something, and has thus made an ass of himself. Although Dell computers follow the ATX formfactor and use ATX connectors, Jim is right—the pin configuration on the power supply is indeed different. According to Dell, the design of its power supplies and motherboards are superceded by the ATX 2.01 spec. Dell does use the ATX formfactor, but the pin configuration on the power supply is indeed different; the design provides more current than what the spec calls for. At the time their chassis/power supply combo was developed, Dell felt the extra current was necessary for first-generation P6 processors (i.e., Pentium Pro). If you want to put a new mobo in your Dell, the company recommends that you buy a new power supply as well. And, for the record, The Doctor did contact Mr. Elking and offer to correct any mishaps that may have occurred.

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Our product evaluation process is built on down-and-dirty, hands-on testing. All hardware benchmarking is conducted in the *Maximum PC* lab by *Maximum PC* editors, and whenever possible, we use real-world applications to gauge performance. Our final verdicts, which fall on a scale from 1 to 10, are based on both benchmark results and a subjective appraisal of product features.

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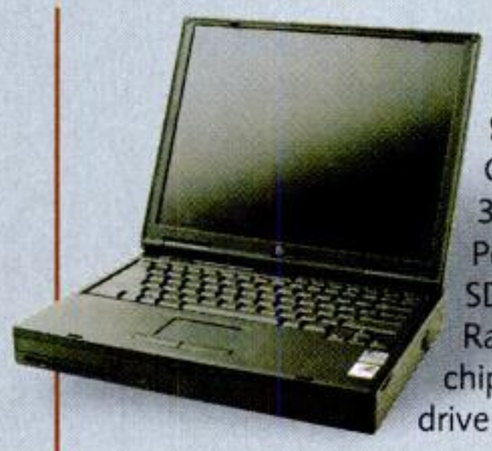
You can always go to **www.maximumpc.com/benchmarking** for the complete explanation of *Maximum PC*'s benchmarking policies.

How to Read the Benchmarks

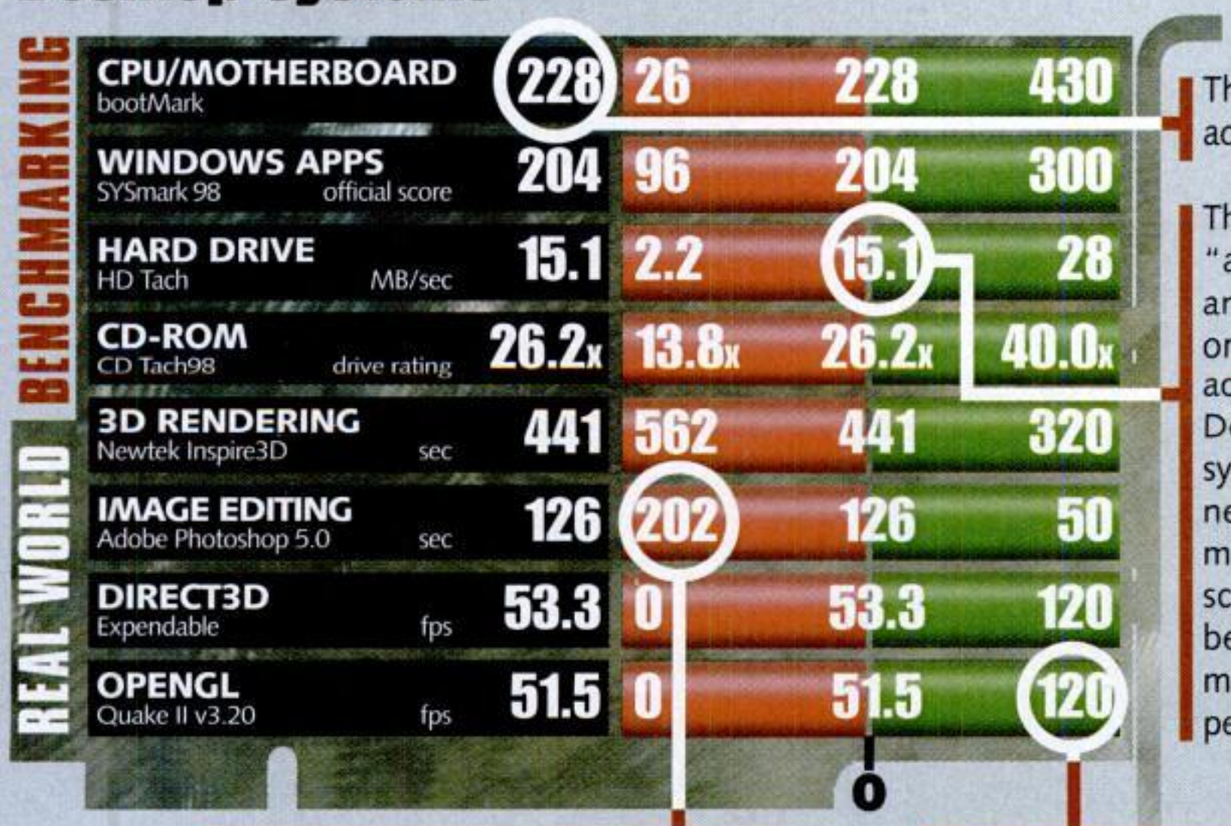
Our Dell Dimension test system is used to establish zero points for all desktop benchmarking and as a test bed for individual component evaluation. The Quantex notebook serves the same purpose for notebook reviews. The base system scores represent the average acceptable performance of high-end machines as of 07/99. We will update the mid-point systems every six months with machines from different OEMs.

DESKTOP ZERO-POINT SYSTEM: Dell Dimension XPS T500: P-III 500MHz, 440BX chipset, 128MB 100MHz SDRAM, 32MB TNT2 videocard, 12.7GB 7200rpm UDMA/33 hard drive, 40x (advertised speed) CD-ROM.



NOTEBOOK ZERO-POINT SYSTEM: Quantex I-1410: 366MHz mobile Pentium II, 96MB SDRAM, 8MB ATI Rage LT Pro video chipset, 8GB hard drive, 4x DVD-ROM.

Desktop Systems



The specific score achieved by the system.

The mid-points denote "acceptable performance" and are based on the precise scores achieved by our base Dell and Quantex systems. As we review new systems each month, their benchmark scores will fall either below or above the mark of acceptable performance.

The more a system underperforms the mid-point system, the further into the red its bar moves. The numbers shown at the low-point are the lowest scores we expect to see in any shipping product.

The more a system outperforms the mid-point system, the further into the green its bar moves. The numbers shown at the high-point are the best scores we expect to see in the next six months.

LABS

KICKIN' THE TIRES ON THE LATEST HARDWARE AND TAKIN' THE LATEST SOFTWARE OUT FOR A SPIN

Hardware Photography by
AARON LAUER

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Dell Dimension XPS B800R

IF THIS ISN'T A 10, NOTHING IS

Dell's latest is the greatest

Cue the *2001: A Space Odyssey* theme, and set the doves free. On this historic day, we bestow a Perfect 10 upon Dell for its contribution to the righteous cause of pure PC power. You don't believe it? Dig these specs: BAM! 800MHz Pentium III Coppermine. BAM! 128MB of PC800 Direct RDRAM. And GAZAAM! A 64MB GeForce 256 videocard.

That's not a typo—it's got a *64MB* GeForce card. And we're not talking ghetto SDRAM, either. It's got the good stuff: Double Data Rate SDRAM. If you think 64MB is overkill, we agree. And we love it. When combined with a Coppermine 800 P-III, the 64MB GeForce (a Dell exclusive) belts out numbers that'll make you cry. In *Quake II*, the GeForce threw down a butta-smooth 65fps at 1600x1200, and, at the same resolution in *Quake III*, it tossed out an almost playable 18.8fps at 1600x1200. If you don't think that's impressive, play *Quake III* at 16x12 with whatever card you have now, and enjoy the slideshow.

Riding next to the GeForce is Intel's most deadly CPU yet: a Coppermine P-III cranked up to 800MHz on a 133MHz bus. We had to vent the smoke from The Lab after the B800R burned rubber on the bootMark with a record 423 score. In comparison, a 733MHz Coppermine machine scored 385, and an 800MHz Athlon reference system scored 374.

On the options front, Dell continues its storage rampage by including a 100MB Zip drive, a Hitachi GD-5000 8x DVD-ROM drive, and an IDE Sony CD-RW drive that burns CD-Rs at 8x, and CD-RWs at 4x. High-speed connectivity opportunities are enabled by a Lucent Wild.Wire combo G.Lite/V.90 modem, and a 3Com 10/100 Ethernet adapter. One of our lone complaints is the smallish 20GB Maxtor hard drive—but at least it spins at 7200rpm on a UDMA/66 interface.

Dell also bucks the softDVD trend by selecting Cinemaster's latest hardware MPEG-2 decoder for movie chores. While it's no Sigma RealMagic card, the Cinemaster—with an assist from Altec Lansing's ADA885 THX-certified speakers—turned our Lab into a mini movie theater. The ADA885 features Dolby Digital decoding, with four discrete channels and a Pro-Logic mode.

We pitted the Dell B800R against an 800MHz reference PC from AMD, and it appears the P-III and Athlon are almost equal. While the P-III gives Athlon a beating in *Inspire* and the bootMark, it also *takes* a beating in our *Photoshop* test. In the intensive *SYSmark98* benchmark, where Athlon previously kicked Pentium III in the head, both machines scored exactly 318. With state-of-the-art benchmarks and primo parts, the B800R is an astounding machine worthy of the highest praise we can offer—a perfect 10.

—Gordon Mah Ung

PLUSES
- 800MHz Coppermine P-III
- 64MB DDR GeForce
- 8x CD-RW
- Dolby Digital 4.1 speakers
- Broadband ready
- USB Mouse, Keyboard

MINUSES
- Smallish Hard Drive

UNDER THE HOOD

THE BRAINS

CPU	Pentium III 800/133
L2 Cache	256KB on-die, full core speed.
RAM	128MB 800MHz Direct RDRAM with ECC (512MB max)
Motherboard	Intel Vancouver, 820 chipset
Drive Bays	Two 5.25-inch, four 3.5-inch (one free)
I/O ports	Two USB, one serial, one parallel, one gameport, composite video-out, S-video-out, S/PDIF, analog audio out

DISPLAY

Video	Dell-branded nVidia GeForce 256 with 64MB DDR SDRAM
Monitor	19-inch Dell P991 (Sony Trinitron, 17.9-inch viewable, 0.25mm dot pitch)
Res/Refresh	R75Hz@1600x1200

STORAGE

Hard Drive	20.4GB Maxtor DiamondMax Plus, UDMA/66, 7200rpm
DVD-ROM	Hitachi 8x GD-5000
CD-RW	Sony CRX-140E (8X/4X/32X)
Removable	1.44MB floppy, Zip 100
Fax/Modem	Lucent PCI Modem/G.Lite DSL card.

SOUND

Sound	Creative Labs Live! Value 512V
Speakers	Altec Lansing ADA885 Dolby Digital 4.1

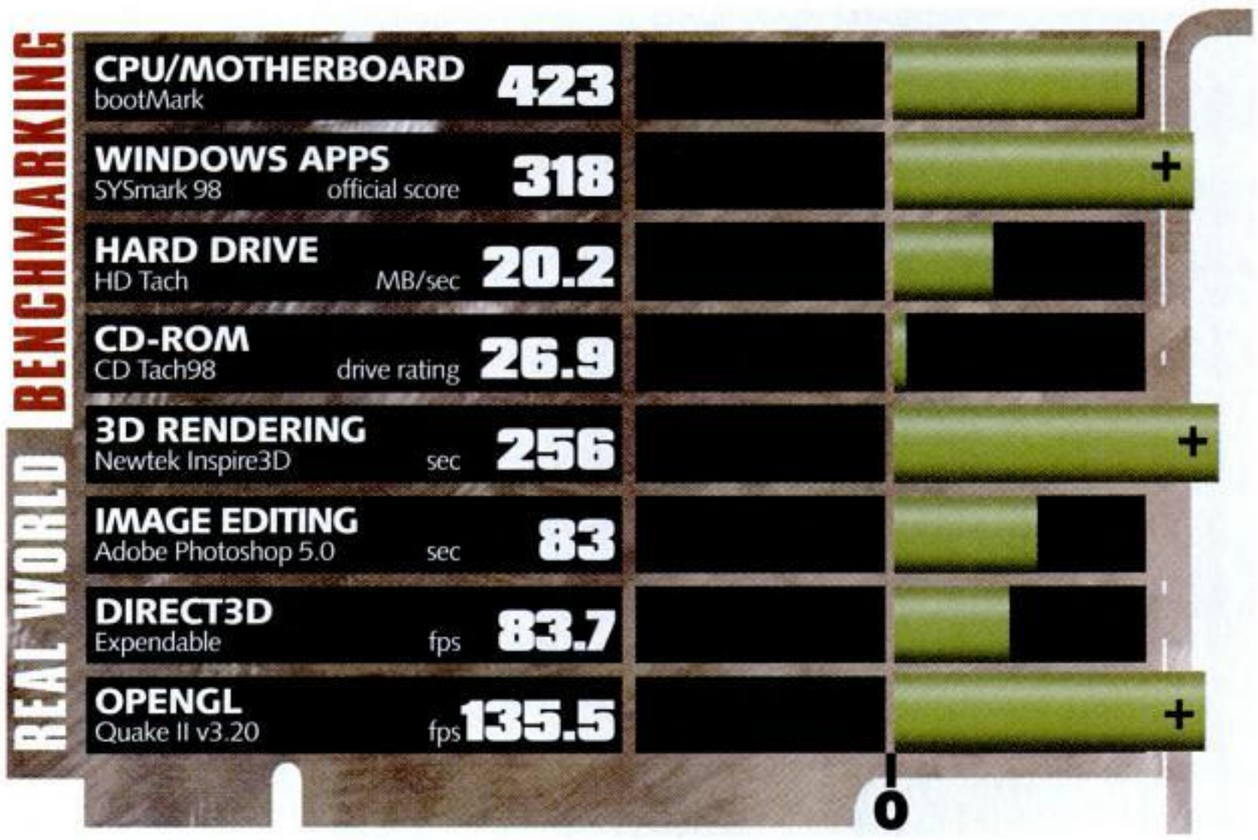
OTHERS

Cinemaster MPEG decoder card, 3Com 905B 10/100 Ethernet card

THE BUNDLE

Microsoft *Works* Suite 99 | Microsoft Clip Gallery | Microsoft Encarta | Microsoft *Word* | Microsoft *Home Publishing 2000* | Microsoft *Money* | Microsoft *Streets and Trips 2000* | Adaptec *DirectCD* | Adaptec *Easy CD Creator 3.5c* | Intervideo WinDVD

BOOT **1:49** DOWN **0:02**



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EXPANSION NOTES

Save a lavish SCSI RAID array, the B800R doesn't beg for any upgrades at all. Nonetheless, it is primed for upcoming CPUs supported by the 820 chipset, and can accept another RIMM on the memory front (please note that one of the RIMM slots in the stock config is filled with a non-working termination device).

EXPANSION MAP

- **AGP** GeForce Card
- **PCI** NIC
- **PCI** DVD decoder
- **PCI** soundcard
- **PCI** modem/DSL
- **PCI** free

IROS

00 System timer	**08** System clock
01 keyboard	**09** DSL/Modem
02 Interrupt controller	**10** Bus Controller
03 SB Live	**11** nVidia GeForce
04 Com 1	**12** PS/2 mouse
05 Free	**13** Num data proc
06 Floppy port	**14** PCI Bus master IDE
07 LPT1 Printer port	**15** Secondary IDE

DMAS

01 Soundcard	**04** DMA Controller
02 Floppy disk	**05** DOS Sound Emulation
03 LPT1	

Daring DDR 64MB of DDR RAM! Need we say more? Only Dell has dared make a 64MB consumer videocard. More memory can grant faster framerates at ultra-high resolutions.

800 Ponies Under The Hood With the 800MHz Coppermine, Intel has narrowed the performance gap between the Pentium III and AMD Athlon.

3D Positional Sound Galore Altec Lansing's ADA885 offers awesome positional Dolby Digital 4.1 sound and is THX certified. It even includes a nifty infrared remote. We like, we like!

Storage Heaven Dell stuffed almost every storage option into the B800R, including an 8x DVD-ROM, 8x/4x CD-R/RW and 100MB Zip. If you need more than that you've got an addiction.

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Rage Fury Maxx

KEEPING UP WITH THE GEFORCES

PLUSES
- Dual chips yield strong performance, especially in 32-bit color
- Very good image quality
- Excellent DVD playback

MINUSES
- Currently works only with Win98
- Not as fast as GeForce SDR

THE SPECS

CLOCK SPEED	125MHz bus/ 143MHz memory
RAMDAC	300MHz
AGP SUPPORT	AGP 4x
LOCAL MEMORY	64MB SDRAM
MAX 32-BIT RESOLUTION	1600x1200
MAX 16-BIT RESOLUTION	1600x1200
MAX 1600X1200 REFRESH RATE	85MHz
BUNDLE	Win98 drivers

Though 3dfx grabbed all the headlines in the past few months with its multiple-chip Voodoo5, ATI beat it to the punch with the Rage Fury Maxx, an AGP card that doubles your 3D pleasures with *two* Rage 128 Pro graphics processors working in tandem on one PCB. Of course, ATI works its hot chip-on-chip action much differently than 3dfx. Where the Voodoo5 renders by using programmable SLI and T-buffer image samples, the Maxx uses Alternate Frame Rendering (AFR) to split the workload between the two chips. And the results are pretty damn impressive.

Even the Rage Fury Maxx's lethal dual-processor combo isn't enough to dethrone GeForce, the reigning 3D king.

Think of AFR as tag-team rendering. The card's driver parcels out even frames to one chip and odd frames to the other, and each graphics processor uses its own 32MB frame buffer to tackle an entire frame (neither chip can address more that 32MB at once, so the 64MB spec advertised on the box is a tad misleading). The idea behind AFR is to make sure that one chip is busy crunching up a new chunk of scene data while the other chip is kicking the current scene onscreen.

ATI's new rendering technology succeeds in keeping frames flowing fluidly to your display. We're definitely impressed by the way the company has addressed many of the image-quality issues that plagued its cards last year. The Maxx spits out 3D visuals on par with Matrox's G400 and nVidia's GeForce.

On the 3D performance side, however, we expected much more from the Maxx. The preview board that ATI gave us to play with a few months ago beat the snot out of GeForce SDR boards, such as Guillemot's 3D Prophet and Creative's Annihilator (reviewed in December). But the retail version of the card that we reviewed for this issue managed to connect only one glancing blow against the GeForce (it actually scored higher in our *Half-Life* timedemo). The overall frame rates are still respectable, however. They just aren't fast enough to make nVidia sweat yet.

Though the Maxx is primarily a gaming card that currently works only in Windows 98, it does manage to hold its own on the 2D side. Especially impressive is the Maxx's DVD playback: Video is consistently crisp, with no artifacting or dithering. With either the Maxx or the Pro (reviewed below), you can confidently kiss your hardware DVD decoder goodbye.

—Sean Downey

REAL WORLD BENCHMARKING

	Rage Fury Maxx	Rage Fury Pro
QUAKE II 1024x768 fps	38.2	21.2
HALF-LIFE 800x600 fps	40.2	41.8
EXPENDABLE 1024x768 fps	56.7	52
DESCENT 3 800x600 fps	46.2	would not run

NOTES: Benchmarked on our Dell 500MHz Pentium III test system using version A6.30.1 of the Maxx drivers and 6.22 of the Pro drivers. K7 benchmarks are posted online. As always, V-Sync is enabled =Rage Fury Maxx =Rage Fury Pro

MAXIMUM PC VERDICT

Price $269
Company ATI
Phone 905.882.2600
URL www.ati.com

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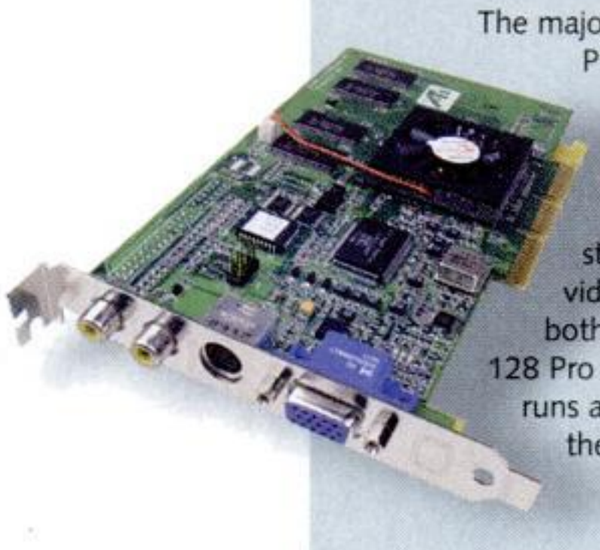
RAGE FURY PRO



The major differences between the Pro and the Maxx are the Pro's lack of a second graphics processor, and its additional TV-out support. Both cards sport strong visual quality and video playback support, and both are based on the Rage 128 Pro graphics processor, which runs at a higher clock rate than the Rage 128 and adds anisotropic filtering, AGP 4X support, and DirectX texture compression to the Rage 128 mix.

The Rage Fury Pro improves on last year's Rage Fury card with slightly faster performance and better video support. In fact, the Pro is as well-rounded as any videocard you can get—but it just doesn't haul ass when it comes to 3D performance, especially on next-generation engines such as *Quake III* and *Unreal Tournament*. This explains why ATI needed to double up the chips in the Rage Fury Maxx to produce a competitive part.

MAXIMUM PC VERDICT

Price $150
Company ATI
Phone 905.882.2600
URL www.ati.com

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All Keyed Up

THESE AIN'T YOUR DADDY'S KEYBOARDS

Don't dismiss keyboards as necessary but homogenous peripherals—all are not created equally. Three new keyboards from long-time rivals Logitech and Microsoft do everything from enabling mouseless web surfing, to acting as USB hubs. Besides, can you really call yourself a power user if even one of your components isn't pimped out? All of the keyboards below offer soft response, so if you prefer high-tension key rebounds with audible, hard clicks, look elsewhere.

—Kenn Durrence

Microsoft's Speed Racer keyboard offers more options than your dental plan.

Microsoft Natural Keyboard Pro

MAXIMUM PC KICK ASS! product

Microsoft's Natural Keyboard Pro offers plush ergonomic comfort and just about every option imaginable. Power users call it the "Speed Racer" keyboard because its 19 hot keys look like the special feature buttons found in the Mach 5 race car. The hot keys launch web pages and Windows functions, such as a mail client, your home page, or My Computer. Several of the hot keys are customizable through the Control Panel. The Speed Racer also includes a USB hub, with two ports on its rear. Another nice touch: Letter keys that correspond with basic Windows shortcuts (e.g., cut, copy, and paste) are marked with shortcut names, a nice assist for newbies and folks with bad memories.

While the price may seem a bit high at $75, keep in mind that the board is a full $25 cheaper than the original Microsoft ergonomic keyboard when it debuted. This is the best ergo keyboard available, and the price is well-justified if you want ultimate comfort and options.

MAXIMUM PC VERDICT

Price $75
Company Microsoft
Phone 425.882.8080
URL www.microsoft.com

9

Microsoft Internet Keyboard

The Internet Keyboard is the little brother of the Natural Keyboard Pro. It offers comparable Internet functionality, but has a less ergonomic design. Missing are the CD and Media controls, the USB ports, and ergo key placement. In place of these features is an odd arch at the base of the keyboard that keeps your hands away from the keys; the included snap-on wrist rest just added to our initial discomfort. Over time, however, we became one with the design, and typing proceeded like second nature. The Internet Keyboard allows for full hot key customization, letting you assign URLs to the various buttons adorning the top of the board.

If you're looking for a web-enabled keyboard that's not as curvy or pricey as the Natural Keyboard Pro, the Internet Keyboard is an inexpensive option that offers an adequate mixture of Internet features and comfort.

The Internet Keyboard takes some getting used to.

MAXIMUM PC VERDICT

Price $30
Company Microsoft
Phone 425.882.8080
URL www.microsoft.com

7

Logitech Internet Keyboard

Logitech's entry is an excellent keyboard that brings extra functionality to the table via audio hot keys and music software. The audio keys control your music player of choice with the usual Stop, Play, and Pause buttons. Four customizable hot keys are also included, for quick access to your favorite web sites. The bundle includes AudioSoft's *Virtuosa*, which lets you play CDs, rip CDs to .WAV, encode .WAV to MP3, burn CDs, and organize all of your music into a single database. Our only beef is that you receive a truncated version of *Virtuosa*; after several weeks, you have to cough up $30 if you want to continue to burn CDs, or have access to *Virtuosa*'s online database of free MP3s.

The keyboard has 104 keys, and a design that's instantly comfortable. Keystrokes are easy on the fingers and the keys are responsive. Choosing between the Logitech Internet keyboard and Microsoft models comes down to whether you want CD controls or Internet controls, but we enjoyed the additional software and comfort level of the Logitech more than the Microsoft Internet Keyboard.

Logitech's keyboard includes audio software.

MAXIMUM PC VERDICT

Price $30
Company Logitech
Phone 800.231.7717
URL www.logitech.com

8

Copyrighted material

PC Time Machine Utilities

GO BACK IN TIME TO NULLIFY YOUR WINDOWS FILE DISASTERS

If you've ever hit the wrong key and watched documents or programs turn into confetti, you've probably longed for a "time machine" utility. If only you had saved a copy of that 10MB spreadsheet before overwriting it! The good news is that PC time machines are now a cottage industry. PowerQuest's *Second Chance* and WildFile's *GoBack* monitor every move you make under Windows 95 or 98, and let you rectify boneheaded blunders, recover old or deleted versions of a file, and revert your entire hard disk to a previous configuration. Note, however, that these programs aren't for everyone. They're just for the small group of people who have experienced problems with Windows.

—Lenny Bailes

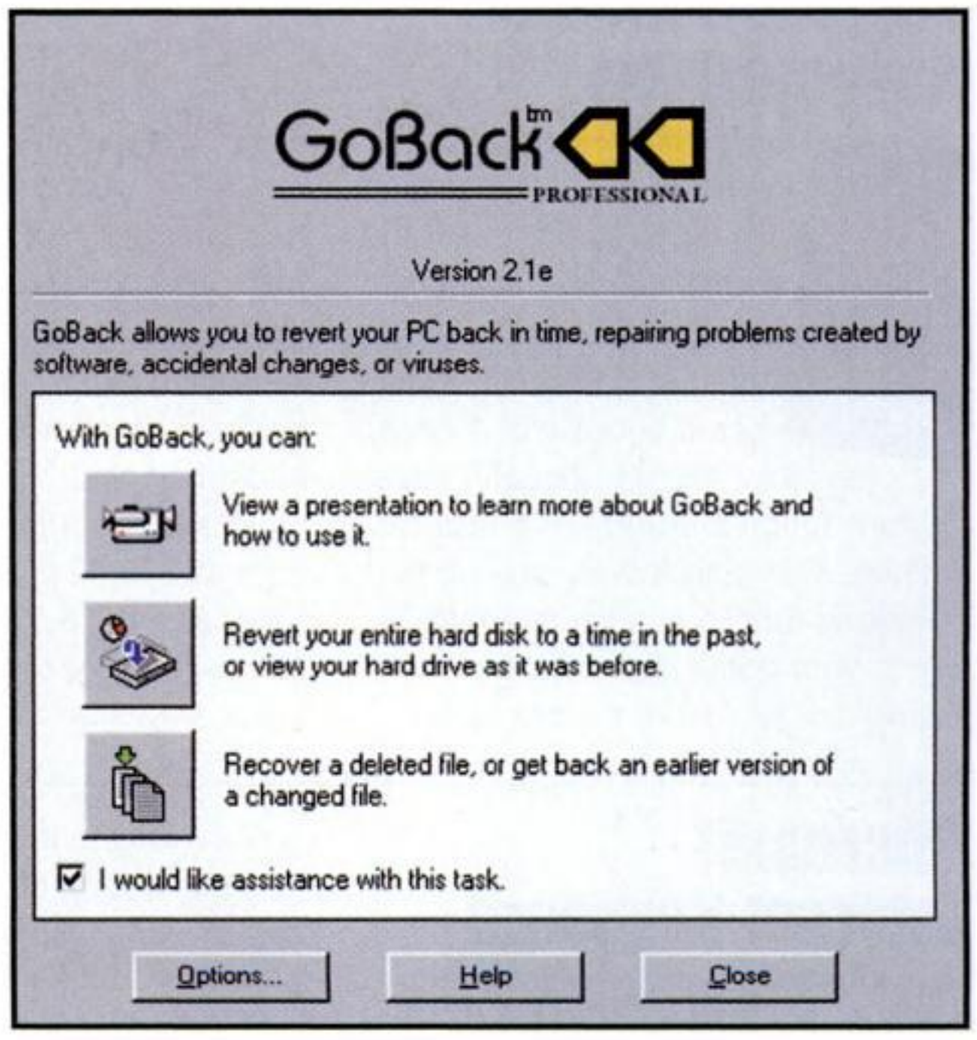
GoBack Professional

If *Second Chance* is an H.G. Wells time machine, *GoBack* is a *Back to the Future* De Lorean. *GoBack* constantly monitors your hard drive and records new "safe points" every time your drive goes idle. Talk about protection! And instead of limiting you to 24 daily saves, *GoBack* lets you restore your hard disk or recover individual files from any date or time after you install the package. *GoBack* records the state of your disk by logging all sector changes to a hidden, write-protected file (the file is stored on your boot drive by default, but you can also put it on a second partition). By default, up to 10% of your available disk space is used.

PLUSES
Amazing functionality
Thorough disk protection

MINUSES
Not good for dual-booters

Like *Second Chance*, the other software reviewed here, *GoBack* provides an easy-to-use menu that offers two basic options: revert the drive to a past condition, or window shop through past file structures without changing the current state. From there you can view the drive "in the past," and copy old or deleted files from the past into the present. But while *Second Chance* only lets you go back to a specific checkpoint, *GoBack* presents you with a calendar, clock, and minute-by-minute system event log. You can use the event log to choose the exact moment in time to which you want to return. Just move the hands of the clock to where you want and presto, you're back to the minute before you installed *Trespasser*. Now you can pretend it never happened.


GoBack tm
PROFESSIONAL
Version 2.1e
GoBack allows you to revert your PC back in time, repairing problems created by software, accidental changes, or viruses.
With GoBack, you can:
View a presentation to learn more about GoBack and how to use it.
Revert your entire hard disk to a time in the past, or view your hard drive as it was before.
Recover a deleted file, or get back an earlier version of a changed file.
I would like assistance with this task.
Options...
Help
Close

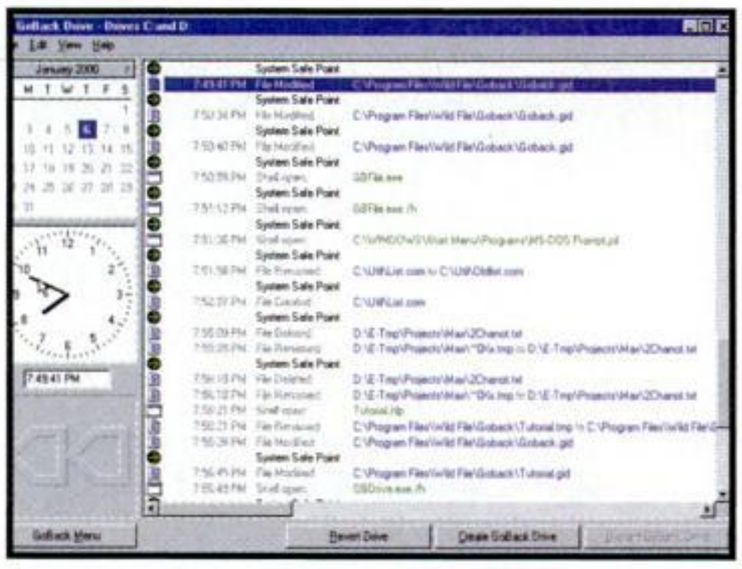
GoBack's main menu lets you revert an entire drive or recover individual files.

When put to the test of our Windows crashing scenario, *GoBack* performed flawlessly. After we crashed the test unit, we booted into DOS and let *GoBack* work its magic. After examining our options, we chose to return to our last successful boot. A few clicks later, and we were back in good shape.

During operation, *GoBack* will reduce the data transfer throughput of your hard drive by between 5% and 10%, which is always the Achilles heel of "monitoring" programs. Still, we never noticed any appreciable slowdowns. *GoBack* and *Second Chance* support both UDMA IDE and UltraSCSI drives.

GoBack doesn't care if you reformat your C drive, have all your files wiped out by a virus, or trash your FAT under either Windows or real-mode DOS. It will put everything back to the way things were 10 minutes ago, yesterday, or last week.

GoBack is easily the most foolproof way to protect the family jewels. Despite the fact that you have to disable it to dual boot or make a partition, *GoBack* offers the highest level of protection to be found on a PC for under a Benjamin.



***GoBack* maintains a complete log of system events, allowing you to revert a drive to any specified date and time.**

MAXIMUM PC VERDICT

Price $70
Company Wild File, Inc.
Phone 1.888.945.3345
URL www.goback.com

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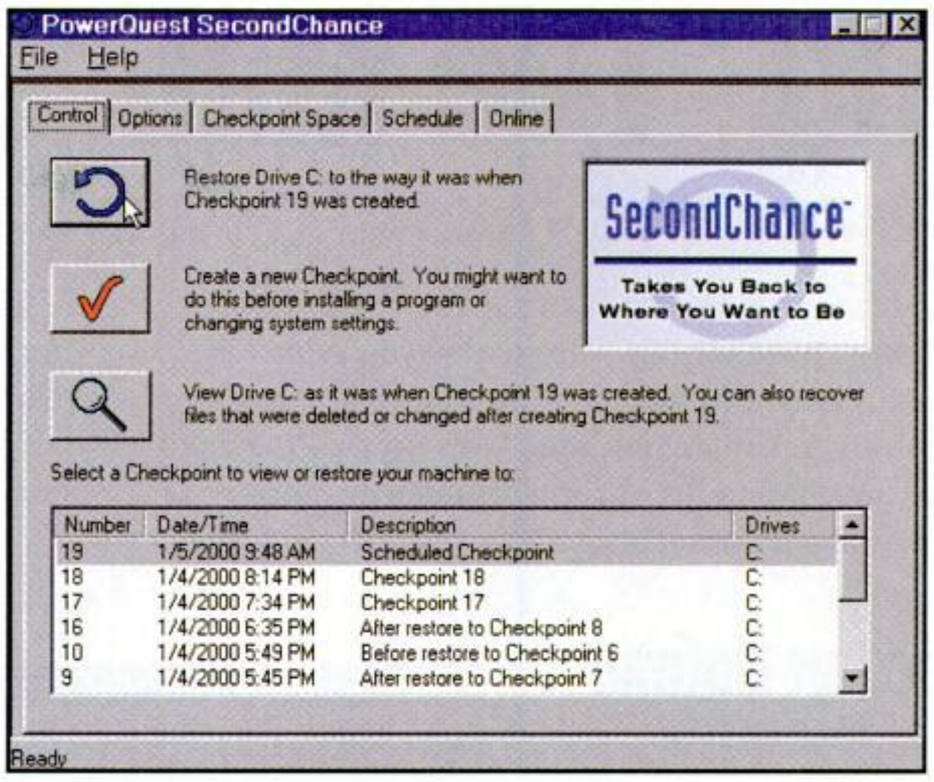
PowerQuest Second Chance

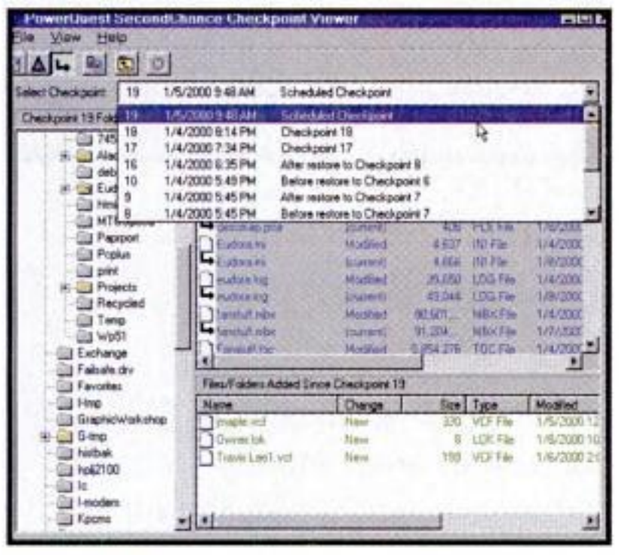
PowerQuest's *Second Chance* offers just that—a second chance to restore your data, should Windows decide to get medieval on your hard drive. It's not as robust as *GoBack*, but it has many handy features that nearly close the gap.

Second Chance is an automated backup program that tracks changes to your files and stores them in a protected subdirectory (the directory resides on your boot drive by default, but you can also put it on another partition). Changes are stored in "checkpoints" that are snapped according to your own schedule. The default is one checkpoint per day, but up to 24 checkpoints per day can be saved. The utility consumes anywhere from 250MB to 450MB of drive space, depending on how many checkpoints you specify. Checkpoints can also be saved manually. We particularly relish the ability to create a "perfect system" checkpoint immediately prior to installing dubious drivers or software.

Second Chance's intuitive menu lets you restore your disk to its state at any recorded checkpoint, or browse the disk structure at any checkpoint and copy older file versions (or deleted files) from the "past" into the "present." *Second Chance* is unfazed by most disk and OS configuration changes, and you don't have to disable Checkpoint protection in order to create new partitions, dual-boot the computer, or change the active boot partition. This is much less sensitive than *GoBack*, which must be disabled if you want to change partition configurations or dual boot.


PowerQuest SecondChance
File Help
Control Options Checkpoint Space Schedule Online
Restore Drive C: to the way it was when Checkpoint 19 was created.
Create a new Checkpoint. You might want to do this before installing a program or changing system settings.
SecondChance
Takes You Back to Where You Want to Be
View Drive C: as it was when Checkpoint 19 was created. You can also recover files that were deleted or changed after creating Checkpoint 19.
Select a Checkpoint to view or restore your machine to:
Number Date/Time Description Drives
19 1/5/2000 9:48 AM Scheduled Checkpoint C:
18 1/4/2000 8:14 PM Checkpoint 18 C:
17 1/4/2000 7:34 PM Checkpoint 17 C:
16 1/4/2000 6:35 PM After restore to Checkpoint 8 C:
10 1/4/2000 5:49 PM Before restore to Checkpoint 6 C:
9 1/4/2000 5:45 PM After restore to Checkpoint 7 C:
Ready

***Second Chance* allows you to revert your hard drive to past states recorded in discrete checkpoints.**



***Second Chance* allows you to copy to your current disk configuration individual files that existed at any specific checkpoint.**

In real-world testing, *Second Chance* worked exactly as advertised. Although it was hard to get Windows to crash (pause for laughter), we crashed our copy of Win98 by copying incorrect DLL files into the Windows\System directory. When Windows refused to boot and advised us to reinstall, we booted to DOS, ran the *Second Chance* restore program, and returned the system to a previous, bootable checkpoint. We also successfully overwrote a few documents, then recovered previous versions. However, we were only allowed to go back to one version per day unless we manually created additional checkpoints. *GoBack* has the advantage here, as it allows you to automatically recover any saved version of a file created at any time.

By default, *Second Chance* is configured to exclude temporary directories (such as \Windows\Temp and any directory named TMP or Temp on your hard drive) from its checkpoint archives. In the shrink-wrapped version 2.00 we reviewed, this is an internal feature that can't be altered. But v. 2.01, which you can automatically install from PowerQuest's web site, makes this an optional feature; you can track the entire hard disk or create custom exclude lists.

If you're looking to recover files in the Windows and Windows\System directories, the *Second Chance* manual recommends that you restore the entire drive to a previous checkpoint, rather than attempting to grab individual system files. *Second Chance* didn't prevent us from recovering an older version of the System Registry (SYSTEM.DAT) and overwriting the current Registry. This action caused Windows to complain about Registry problems and prompt for a shutdown. When Windows came back, the normal backup copy of the Registry was dated from before the *Second Chance* installation, making the program inoperable. Although the normal Windows 98 Scanreg feature was confused, the *Second Chance* checkpoints were still on the disk. We were able to boot to a DOS prompt, go to the *Second Chance* directory, and run the Restore program. This returned Windows to a configuration that existed *after* the *Second Chance* installation, but before we attempted our ill-advised recovery of the old SYSTEM.DAT file.

Second Chance isn't indestructible; if an ill-behaved Windows program or virus destroys your FAT table, it takes the *Second Chance* archive along with it, and you lose everything. *Second Chance* is also inactive if you boot into a real-mode DOS prompt and make changes there. System resources are always an issue with monitoring programs, but *Second Chance* uses a virtual device driver that only takes up 1MB of system memory.

All in all, *Second Chance* is a dependable but limited data-recovery utility. It's easy to use, but lacks the sophisticated "any-time-and-date, under Windows or DOS" recovery power of *GoBack*. We appreciate the fact that it runs automatically, making backup a no-brainer, but its limited number of saves per day and vulnerability to viruses lowered its verdict.

PLUSES
Simple interface
Non-invasive

MINUSES
Less functionality than *GoBack*
Vulnerable to FAT mishaps

MAXIMUM PC VERDICT

Price $70
Company PowerQuest
Phone 800.379.2566
URL www.powerquest.com

8

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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Paying "The Man"

MAXIMUM PC GIVES TAX SOFTWARE AN AUDIT

April 15th is quickly approaching, and unless you're a complete deadbeat, you'll soon be scrambling to finish your annual confessionals to Uncle Sam and Aunt State. PC-based tax programs can save you a lot of time and hassle, and make your computer useful for something other than *Quake III*. We rounded up the three biggest names in PC tax software and pitted them against one another. If you're paying taxes this year, let one of these programs do the dirty work for you. They really can help.

—Dan Morris, C.P.A.

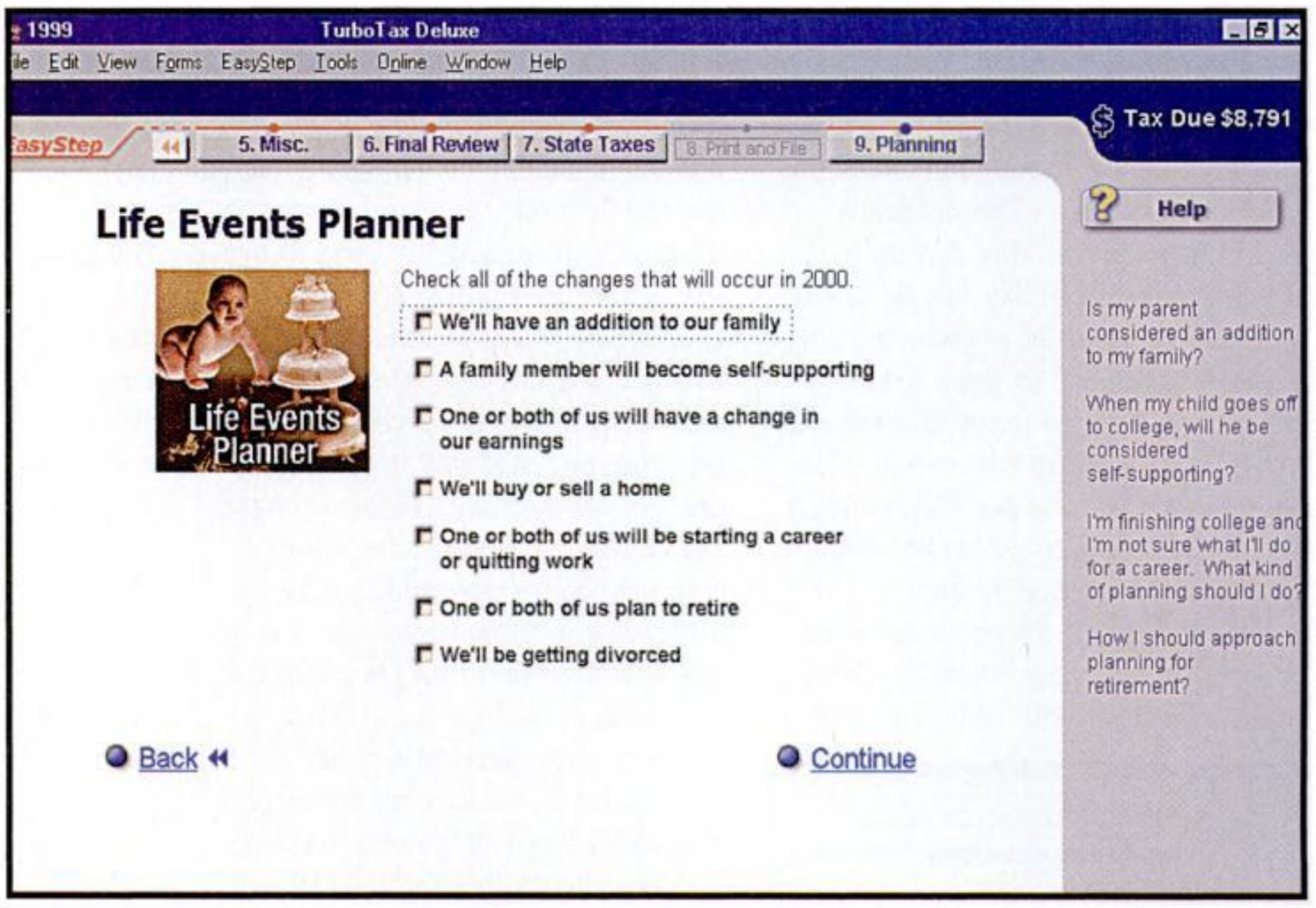
Intuit TurboTax Deluxe

Intuit is the king of financial software, and every time we pick up one of its software packages, we're reminded why. *TurboTax Deluxe* is an extremely helpful program, not only for doing your taxes, but also for financial planning.

The program lets you file your taxes one of two ways: by entering your data manually into electronic tax forms, or by proceeding through an "interview" in which you're asked to compile all your data from your W2s. Although the interview is time-consuming, it's the best way to assemble your data into a complete and accurate return. Intuit's questions and instructions are concise and easy to comprehend.

TurboTax's strong suit is the expert help it offers. The life events planners and basic planning advice are almost more beneficial than the actual tax preparation assistance. You'll receive tips on preparing for retirement, as well as information on the financial impacts of raising children, getting married, and filing for divorce.

Competent video presentations appear throughout the program, explaining topics such as understanding the W-2 form, the difference between a business and a hobby, and retirement planning. Additionally, the deluxe version we tested includes a copy of *Money* magazine's Tax Handbook, which explains complicated IRS rules and regulations in plain English.


1999
TurboTax Deluxe
File Edit View Forms EasyStep Tools Online Window Help
EasyStep
5. Misc.
6. Final Review
7. State Taxes
8. Print and File
9. Planning
Tax Due $8,791
Help
Life Events Planner
Life Events Planner
Check all of the changes that will occur in 2000.
We'll have an addition to our family
A family member will become self-supporting
One or both of us will have a change in our earnings
We'll buy or sell a home
One or both of us will be starting a career or quitting work
One or both of us plan to retire
We'll be getting divorced
Is my parent considered an addition to my family?
When my child goes off to college, will he be considered self-supporting?
I'm finishing college and I'm not sure what I'll do for a career. What kind of planning should I do?
How I should approach planning for retirement?
Back
Continue

***TurboTax*'s life events planner offers better advice than your parents, and can save you big bucks in future returns.**

In other areas, though, *TurboTax* is hit and miss. For example, while searching the rules associated with leased vehicles, the interview process provided continual information and instructions, but when we got to the end and found that we still needed more information, the program pointed us to the IRS web site.

TurboTax includes several features that can speed up your filing process. The program can search for *Quicken* and *Quickbook* files to assist in transferring data into *TurboTax*, saving you the time it takes to enter investment, business, and itemized deduction information. If you've entered all of your stock trades in *Quicken*, *TurboTax* will acquire the gain/loss information, and automatically enter the details onto the appropriate tax form. Although not automatic, *TurboTax* will also transfer Tax Exchange Format (TXF) files from other money management programs. And unlike the other programs, *TurboTax* allows two-digit year references, speeding data entry of date-sensitive items.

Overall, *TurboTax* lives up to Intuit's "intuitive" promise. It's a complete solution for online tax filing, offering clear instructions, quick data entry, and excellent planning suggestions. The extras—such as the *Money* Tax Handbook, the ability to file state returns, and the one free electronic filing—are simply icing on the cake, making *TurboTax* the best package for the do-it-yourself tax preparer.

TurboTax Deluxe
File Edit View Forms EasyStep Tools Online Window Help
EasyStep
1. Personal Info
Welcome
Using the New Features In TurboTax Deluxe
Misc. - Tax Tip
Video
Welcome to TurboTax Deluxe... America's #1 tax software.
For an overview of how to use TurboTax, click the "Play" button on the video above.
To learn about the latest TurboTax enhancements and tax law changes click here.
Let's Get Starte

***TurboTax*'s tax preparation interview is easy to follow, yet time consuming.**

MAXIMUM PC VERDICT

Price $30
Company Intuit
Phone 800.446.8848
URL www.turbotax.com

9

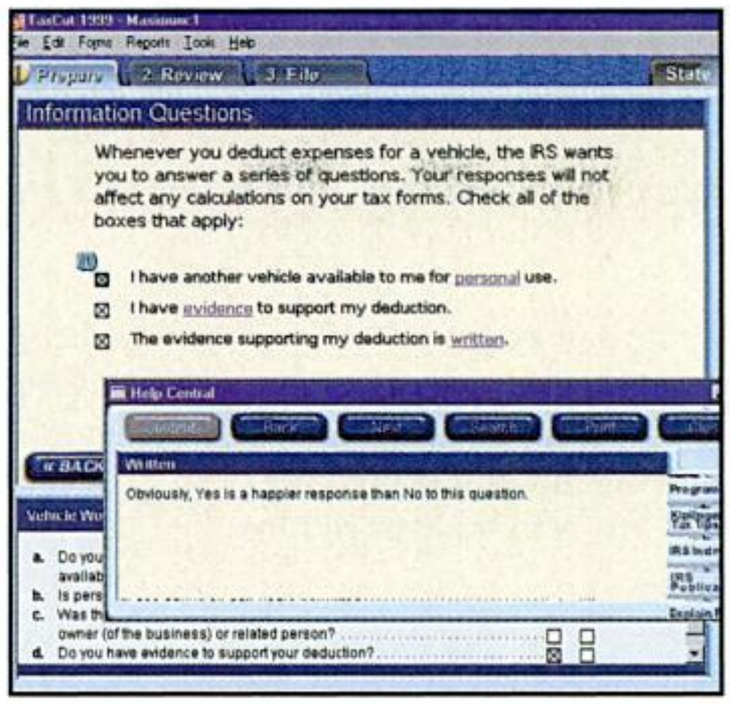
Copyrighted material

Kiplinger TaxCut Deluxe

Famed tax-preparation and financial services conglomerate H&R Block brings us *Kiplinger Tax Cut Deluxe*, the "fastest and easiest way to do your taxes." While it's certainly a robust program that allows filing of state and federal returns, it's hindered by small annoyances that ultimately detract from the tax return process.

TaxCut is similar to *TurboTax* in that it provides the same two choices for entering your tax information: directly onto electronic forms or through an interview process. And, as in *TurboTax*, the interview process is the better option. The questions are asked in a more casual manner than the other programs, but *TaxCut* bombards you with images of happy families vacationing and quotes about tax preparation that are downright ridiculous.

TaxCut offers expanded explanations during the interview process, but they're completely useless. While leading us through the process of deducting automobile expenses used by employees, *TaxCut* asks if the taxpayer's evidence is "written." The expanded advice for the word "written" simply states, "Obviously, Yes is a happier response than No to this question." Kiplinger made a funny! But we're not laughing.


Edit Forms Reports Tools Help
Prepare
2. Review
3. File
State
Information Questions
Whenever you deduct expenses for a vehicle, the IRS wants you to answer a series of questions. Your responses will not affect any calculations on your tax forms. Check all of the boxes that apply:
I have another vehicle available to me for personal use.
I have evidence to support my deduction.
The evidence supporting my deduction is written.
Help Central
Written
Obviously, Yes is a happier response than No to this question.
owner (of the business) or related person?
d. Do you have evidence to support your deduction?

***Kiplinger*'s "help" is useful at times, and downright ridiculous at others.**

Despite the bad jokes, *TaxCut*'s interview process can be very helpful at times. It offers reminders to double-check important data such as Social Security Numbers and W-2 amounts, warning that mistakes in these areas will invite IRS scrutiny and slow down your refund. And during the interview section dealing with receipt of capital gains from mutual funds, *TaxCut* advises users to search out federal interest information that, if applicable, will save you money in state taxes.

Kiplinger also recognizes that new users may have processed their prior year's returns using *TurboTax* and provides an automatic data exchange between *TurboTax* and *TaxCut* (Intuit doesn't offer a similar feature).

Valuable aspects of *TaxCut* are undermined by little annoyances such as not being able to use "various" as the purchase date of charitable donations (only *TurboTax* does). *TaxCut*'s Alternative Minimum Tax interview was also somewhat incomplete, requiring users to refer to official IRS instructions to ascertain the exact nature of information required by the program.

Overall, *TaxCut* is a solid program that's tarnished by little things here and there. Its happy families and one-liners, along with the forced loading of videos, detract from the process, ultimately making the package less desirable than *TurboTax*.

MAXIMUM PC VERDICT

Price $40
Company Block Financial
Phone 800.457.9525
URL www.taxcut.com

7

Microsoft TaxSaver Federal Deluxe

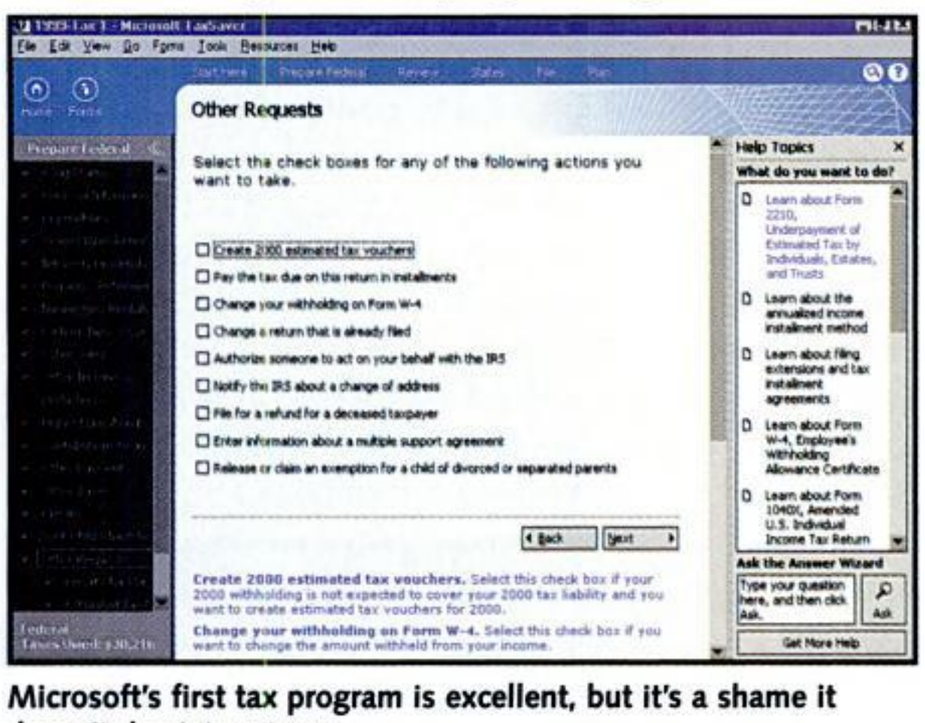
Microsoft teamed up with Big 5 tax firm Arthur Andersen to publish *TaxSaver*. The result is a tremendous product for residents of the five states without a separate state tax (Washington, Florida, Texas, Nevada, and Alaska). For residents of the other 45 states and the District of Columbia, *TaxSaver* requires you to download PDF tax returns and fill them out on your own, almost defeating the purpose of using your PC for tax filing, since the program only completes half of the process.

Like *TurboTax* and *TaxCut*, *TaxSaver* provides a direct entry option and an interactive interview. The interview is clear, and the videos are unobtrusive and extremely informative. In grand Microsoft tradition, the program's interview interface has a "web feel" to it that allows you to bookmark specific entry lines for future research and clarification. This bookmark feature is extremely helpful in that it allows users to enter an estimate or similar answer knowing that they will be reminded to return to that entry screen prior to completion, thereby expediting the first pass of the tax return preparation process.

The interview questions are well written, leading you step-by-step through the maze of IRS complexities. And, unlike *TurboTax* and *TaxCut*, *TaxSaver* highlights common tax credits (such as mortgage credits) early in the interview, rather than burying them later in a separate and unrelated interview screen. *TaxSaver* also offers plain English guides that clearly explain the tax code and form instructions. Additionally, *TaxSaver* has more than 350 easily accessible help topics. *TaxSaver*'s explanations and interview questions regarding topics like the Alternative Minimum Tax are superior to both *TurboTax's* and *TaxCut's* content. The only thing we didn't like about the interview process is that date-sensitive fields require "slashes," slowing down data entry since forgetting the slash requires you to back up and correct the date.

TaxSaver's review process was also easier to use than those found in *TurboTax* and *TaxCut*. Unlike the others, *TaxSaver* allows for immediate interactive corrections to highlighted items, allowing you to simply "click and fix," then return to the review.

If *TaxSaver* allowed for integrated state tax processing, it would be the best of the bunch. Unfortunately, the majority of taxpayers live in states that collect tax information, and *TaxSaver's* inability to process state forms is a glaring flaw.


Other Requests
Select the check boxes for any of the following actions you want to take.
Create 2000 estimated tax vouchers
Pay the tax due on this return in installments
Change your withholding on Form W-4
Change a return that is already filed
Authorize someone to act on your behalf with the IRS
Notify the IRS about a change of address
File for a refund for a deceased taxpayer
Enter information about a multiple support agreement
Release or claim an exemption for a child of divorced or separated parents
Back
Next
Help Topics
What do you want to do?
Learn about Form 2210, Underpayment of Estimated Tax by Individuals, Estates, and Trusts
Learn about the annualized income installment method
Learn about filing extensions and tax installment agreements
Learn about Form W-4, Employee's Withholding Allowance Certificate
Learn about Form 1040X, Amended U.S. Individual Income Tax Return
Ask the Answer Wizard
Type your question here, and then click Ask.
Ask
Get More Help
Create 2000 estimated tax vouchers. Select this check box if your 2000 withholding is not expected to cover your 2000 tax liability and you want to create estimated tax vouchers for 2000.
Change your withholding on Form W-4. Select this check box if you want to change the amount withheld from your income.

Microsoft's first tax program is excellent, but it's a shame it doesn't do state returns.

MAXIMUM PC VERDICT

Price $45
Company Microsoft
Phone 888.218.5617
URL www.moneycentral.msn.com/taxsaver

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Copyrighted material

Multifunction Printers

ONE FOR THE OFFICE, ONE FOR THE ARTIST

In our December 1999 issue, we named the HP Office Jet R-80 Printer of the Year, confident in our opinion that it was the best consumer-level printer available at the time. But Epson's first foray into multifunction printers, the Stylus Scan 2500 Pro, is making us rethink our decision. The HP is faster at general office tasks, but the Epson's print quality is superior. So who wins? Read on.

—Geoffrey Visgilio

Epson Stylus Scan 2500 Pro

The quality and detail of the images produced by Epson's first venture into the all-in-one printer arena are simply amazing. Text is crisp, the edges of letters are razor sharp, and illustrations and line drawings are so faithful to the originals, we thought some photo reproductions were actual photographs.

With a max resolution of 1440x720 dpi and a super-fine inkjet droplet size, we had to pull out a magnifying glass to see any pixelization in images printed at the highest quality setting. There are three available quality settings—normal, fine, and photo—and unlike the HP, printing at the high-quality setting doesn't cost precious time. At its lowest quality setting, the Epson is able to crank out a photo print in about two minutes with no enhancement options (such as a "people" setting that brings out flesh tones) enabled. The jump to the "photo" quality setting tacked on an extra 30 to 50 seconds.

THE SPECS

HEAD	4 color CMYK drop-on-demand Micro Piezo head
MAX PRINT RES	1440x720
RATED SPEEDS	6 ppm black 5 ppm color
PAPER TRAY CAPACITY	100 sheets
INTERFACES	Parallel USB
SCANNING RES	600x2400 dpi
SCANNING COLOR DEPTH	36-bit internal/ 24-bit external
BUNDLE	EPSON *Smart Panel* | Adobe *PhotoDeluxe* | NewSoft *Presto* OCR | *WinFax Basic* | *EFax*

PLUSES
- Print quality is phenomenal
- Scanning is great, too
- USB support

MINUSES
- Works best with Epson paper
- Slow copying speeds

The Epson nailed our *PowerPoint* test, cranking out a rough draft of our 17-page presentation in a quick 12 minutes on regular paper. Our final draft—reproduced in brilliant, vibrant color on Epson-branded paper—took just under an hour.

The machine's scanning ability is equally impressive. With a 600x2400 dpi scanning resolution and 36-bit internal color depth, the Epson performed very well in our counterfeiting test, scanning and printing funny money so faithful to Uncle Sam's originals, we could pick up individual striations in portraits. (Buyer beware: In this age of amazing imaging hardware, be careful not to let a store clerk pass you an ersatz ducat.)

The Epson produced such nice prints, we thought they were professional photographs.

We started to see trade-offs between quality and speed in our photocopying tests. Copies were nice and sharp, but printing a simple black-and-white copy of our *PowerPoint* presentation took almost 12 minutes, and a color copy took 16 minutes. The Epson is also painfully slow when copying simple business documents, such as line drawings and memos.

Another downside is the Epson's lack of stand-alone faxing functions; you have to connect it to a PC equipped with a fax-modem in order to send and receive faxes. Epson tries to make up for this with its *Smart Panel* software package. This software is intuitive and easy to use, but we got the feeling that it was thrown in as an afterthought.

The biggest drawback is that Epson paper is required to fully realize the printer's potential. Epson says the printer produces high-quality prints and copies on any paper, but we found that even the best photo-quality paper made by other companies couldn't produce the same results. We don't fault Epson for tying its products together, but please be warned that the Epson paper is integral to the printer's performance.

MAXIMUM PC VERDICT

Price $550
Company Epson
Phone 800.873.7766
URL www.epson.com

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Copyrighted material

HP Office Jet R-80

The R-80 is a fantastic multifunction printer. It's fast and quiet. It can scan, copy, and print. It even has stand-alone fax capabilities. But like any do-it-all piece of hardware, it makes some sacrifices for the sake of functionality. It's blazing fast when copying text-based documents and photos, but forfeits some image quality for all this speed.

The HP offers color printing at a run-of-the-mill 600x600 dpi. However, its PhotoREt II layering technology makes up for the relatively low resolution by firing up to 16 drops of ink onto each image composition dot, allowing for greater color mixing opportunities and therefore a wider range of colors per each dot. The end result is smoother photo reproduction and less pixelization than you'd expect from a 600x600 printer. And because high dpi documents take longer to print, the HP's relatively low dpi setting actually fosters speedy print times. The unit prints text and simple documents amazingly fast, and we were surprised it could bang out text-heavy prints in under 30 seconds.

The HP is even speedy when making photo reproductions. At the lowest quality setting, a print takes about two minutes on regular paper, and comes out looking crisp and sharp. But it's glaringly obvious, especially at the low settings, that the HP is skimpy on ink. Our photos and text looked a bit washed-out, as if they had been left out in the sun.

The printer offers three levels of image quality—fast, normal, and best—and the difference between "fast" and "best" is like night and day. Image quality increases dramatically at the "best" setting, but unfortunately, printing times increase, too. At the best setting, prints took six minutes on average. And while these prints weren't as washed out, the printer's color management added too many mid-tones, resulting in fleshtones that looked grainier and more orange than the original photography.

The HP is definitely best-suited for general office tests—such as printing memos and black-and-white business documents—because when it has to make numerous color prints, the machine sucks wind. In our 17-page *PowerPoint* presentation test, the HP took almost 17 minutes at its rough-draft setting (black and white on normal paper), and over an hour at its best image-quality setting (color on special inkjet paper). The printer was skimpy on the ink again, too, leaving our *PowerPoint* presentation looking sunwashed like the previous prints.

Low-quality prints were much quicker. The *PowerPoint* test took just five minutes using plain copier paper, and about seven minutes using Ink Jet paper in color.

The HP's scanning performance was less than excellent. We scanned paper money to test the 600x2400, 30-bit output, and while the detail reproduction was dead-on, the color was lime green around the borders, and faded and dull in the central portrait and Federal seals.

All told, the Office Jet is a decent all-around machine that quickly produces high-quality results at its fastest settings. The print, copy, and scan quality is more than enough for a small office, and the stand-alone fax capability is a big plus. But image quality and speed are two things we expect from an $800 printer, and the HP let us down in both areas.

The HP is big, mean, and fast, but its print quality is, sadly, only average.

PLUSES
- Stand-alone fax
- Easy software setup
- Fast printing at low-quality setting

MINUSES
- Expensive
- Average image quality

THE SPECS

HEAD
PhotoREt II technology head

MAX RESOLUTION
600x600

RATED SPEEDS
8.5 ppm color
11 ppm black

PAPER TRAY CAPACITY
100 sheet document feeder

INTERFACES
Parallel

SCANNING RES
600x2400 dpi

SCANNING COLOR DEPTH
30-bit color/ 8-bit grayscale

BUNDLE
HP *Precision Scan* with OCR package I Adobe *PhotoDeluxe* I KMT Office in Color templates for MS Office

MAXIMUM PC VERDICT

Price $800
Company Hewlett Packard
Phone 888.999.4747
URL www.hp.com/all-in-one

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The Epson: At low-res there's still some amazing text and color clarity in our presentation, though our girl looks a little washed out. At high-res, text is razor sharp and color is even brighter, and our girl looks alive.

The HP: At low-res, text is really washed out, but our camera girl actually looks pretty amazing. At high res, our lines are sharper on the edges of our presentation but are still faded, and our camera girl looks like she ate too many oranges.

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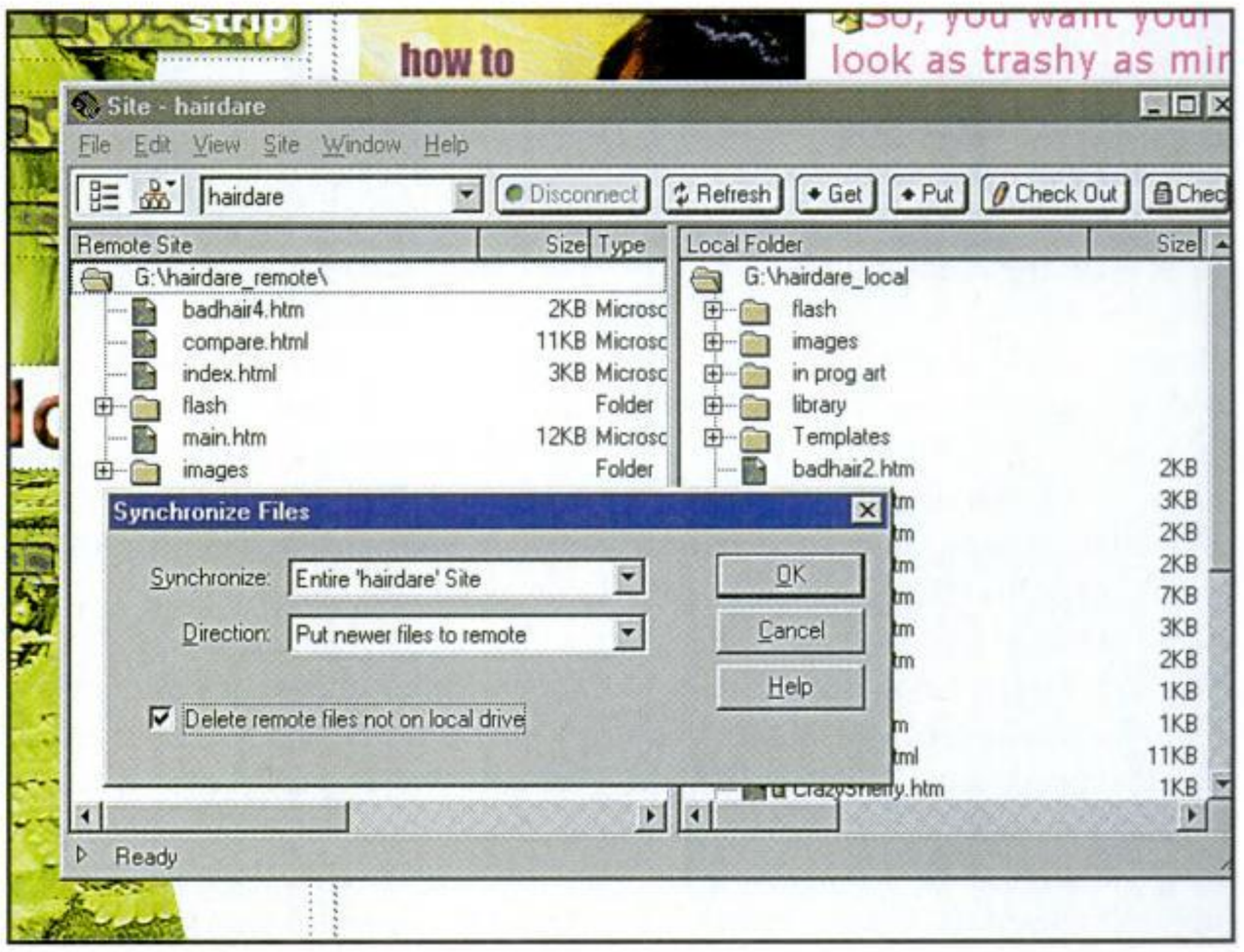
Dreamweaver 3

STILL WYSI WISHING

Dreamweaver has long been considered the only WYSIWYG web site construction program that professional coders would even touch; its site management tools, object-oriented layout tools, and HTML inspector can actually speed up a hard day's work. The latest version is even *more* pro-friendly, with new features that allow you to automate every possible function via scripting. But for a WYSIWYG editor—which by definition should be a tool for people with no hand-coding skills whatsoever—the version 3 upgrade might be useless. If you're averse to hand-coding in the first place, you probably don't have the right temperament to put up with the revised interface and learning curve.



Dreamweaver 3's Synchronize Site command ensures files are fresh and deletes all orphans.

THE SPECS

RICH MEDIA SUPPORT
Flash, Generator, Shockwave, QuickTime, RealNetworks, Beatnik

TAGS RECOGNIZED
HTML, DHTML, XML, ASP, JSP, CFML, PHP

PLUSES
- Synchronize Site Command is great
- Auto-strips proprietary Word HTML tags
- Completely customizable
- Excellent service and support
- Improved integration with Fireworks

MINUSES
- Learning curve is a mountain
- Learning curve includes web languages
- Extremely clumsy font handling

Code hackers will embrace the opportunity to write their own JavaScript in order to customize *Dreamweaver 3*. The Document Object Model (DOM) lets you tweak every menu and object—you can even remove entire menus and functions that aren't being used. While granting this much customization is ingenious, the task itself isn't an easy one, or a useful one for the typical WYSIWYG user.

Some of *Dreamweaver 3*'s new features greatly improve code and site management; the Synchronize Site command rocks the hardest. Previous versions of *Dreamweaver* allowed you to compare the site on your hard drive to your uploaded site, but the Synchronize Site command goes many steps further: It scans the local and remote sites, determines which files are new, rewrites over old files, and even deletes orphaned files that aren't being used anymore. Before it does any rewriting, it displays a dialog box of files about to be updated or deleted, so you can deselect them from processing if necessary. It's idiot-proof, and we love it.

New commands for tabular data makes importing this *Excel* spreadsheet a breeze.

Dreamweaver 3's interface has never been easy to use, but a few new tools might help the visually oriented builder a wee bit. There are several new selections in the Objects palette (which is the only place a novice will ever feel at home), including dates, navigation bars, special characters such as "©," and Insert Fireworks (see the review on page 87). The History Palette, in addition to providing a non-linear, visual overview of your work, can be used to easily generate custom commands. Simply select a list of actions from within History, save them, and apply them from the Commands menu to other objects in your document.

Text tools are probably the most-often-used features of a WYSIWYG app, but *Dreamweaver 3*'s text tool provide more headaches than help. The program's alternative to Cascading Style Sheets (CSS) applies a <font> tag around the selected text, rather than a <class> tag, so the only way to save the new HTML styles is to open the "style.xml" file in the library sub-directory, select the code, and copy it to a new document. It's not the least bit intuitive, let alone helpful to a visual user. Worse, when using CSS, *Dreamweaver 3* doesn't change font assignment if you don't span exactly the same text as you did the first time; it just adds a never-ending chain of tags that don't delete in the "Clean up HTML" command, because technically, they're not nested.

For the professional web design house, *Dreamweaver 3*'s project and code management tools will greatly speed up workflow, once every member of your team figures out the program's idiosyncrasies. But for the novice who speaks only in pictures, the extreme learning curve could pose a major barrier. This is neither a walk through the park, nor a walk to take alone.

—Sherry Monarko

MAXIMUM PC VERDICT

Price $299; $129 upgrade
Company Macromedia
Phone 800.326.2128
URL www.macromedia.com

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For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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Fireworks 3

THROW PHOTOSHOP AWAY

MAXIMUM PC KICK-ASS! product

After Adobe released its web-smart *Photoshop 5.5*, some of Macromedia's web design tools suddenly bordered on obsolescence. With the release of *Fireworks 3*, however, Macromedia has more than caught up with Adobe.

Like its predecessors, this latest *Fireworks* version helps you build web-ready illustrations, buttons, and animations in both vector and bitmap formats. Perhaps even better, your work is always editable, regardless of how far you've proceeded in your project. And *Fireworks* now goes a step further by integrating—and improving upon—some *Photoshop 5.5* mainstays.

For example, both programs offer "live" effects—special visual effects (such as drop shadows) that can be added to an object and edited at will. But *Fireworks 3* adds a palette that allows *any* filter—whether native or third-party—to be a live effect. You can add an entire series of saturation changes, blurs, twirls, and *Eye Candy* effects to the same object, toggle them on and off, and save them en masse to apply to other objects.

While *Photoshop*'s History feature provides a snapshot of file changes in a non-linear fashion, *Fireworks*' new history palette allows you to select a group of actions for use on another object. If you know JavaScript, you can further edit the actions and drive them from *Dreamweaver*. For example, you could create a new navigation button in *Dreamweaver* by copying an existing button, and using your imported JavaScript to change the text and associated code. The initial setup is a bear, but the pot of honey is worth the trouble.

Fireworks now allows you to view rollovers, and optimize slices right in the workspace.

Fireworks 3's export options add "lossy GIF" and "view Mac or PC gamma," which *Photoshop* already offered in version 5.5. But *Fireworks 3* one-ups *Photoshop* by enacting the changes in the actual workspace rather than in a separate interface. *Fireworks 3* also lets you leave gamma changes on, so you can design an entire project in the color scheme that will be seen by users of other platforms. The preview window supports behaviors, so you can test rollovers without a browser. Preview-in-workspace also brings optimization palettes to the main interface, making it easier to reduce file sizes on the fly.

Creating a web site's navigation interface gets easier with *Fireworks*' new button wizard. Use Insert> Button to create up to four button states, and then set export and link options step-by-guided-step. The graphics, their slice, and all associated HTML are automatically placed both on your page and in the library as a "button."

It's the fine details that make this sequel a stellar upgrade. Especially notable is the new HTML preferences setting that lets you avoid that blasted shim row (the invisible <td> crap that made creating tables with stretchable browser widths into a "rebuild-from-scratch" horror). And there are literally dozens of other small fixes and improvements you'll have to see to believe. *Fireworks 3* even allows you to import images from cameras and scanners, so you won't need *Photoshop* for that anymore.

If you want one web graphics app with everything, *Fireworks* is it.

—Sherry Monarko

This wizard creates reusable and editable buttons with up to four states, step by step.

PLUSES

- Death of the shim row
- Ability to preview behaviors in workspace
- Easy-to-use button wizard
- Completely JavaScriptable
- Improved integration with Dreamweaver and other WYSIWYGS
- Excellent service and support

MINUSES

- Library buttons don't update in document
- Box may cause paper cuts

THE SPECS

GRAPHIC EXPORTS
GIF, JPEG, PNG, SWF, PICT, TIFF, BMP

VECTOR EXPORTS
Illustrator, *Freehand*, *Flash*

HTML EXPORTS
Dreamweaver, *FrontPage*, *GoLive*, generic HTML

MAXIMUM PC VERDICT

Price $199; $99 upgrade
Company Macromedia
Phone 800.326.2128
URL www.macromedia.com

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Tomb Raider 4

LARA'S ROOTS ARE SHOWING

The Eidos cash cow with the breasts that defy gravity is back for some tail-kicking action in *The Last Revelation*. The *real* revelation is that this fourth installment is actually a pretty fun game.

In a weird, "we've come full circle" way, *The Last Revelation* is as addictive as the original *Tomb Raider*, a comeback that took us completely by surprise. The worlds are intricately designed, the puzzles are difficult without being impossible, and Core has returned to that delicate melange of exploration, action, and gut-wrenching tension that made the series a smashing success.

THE SPECS

3D CARD SUPPORT
Direct 3D

3D SOUND SUPPORT
Direct Sound, Maestro AC3 (emulated)

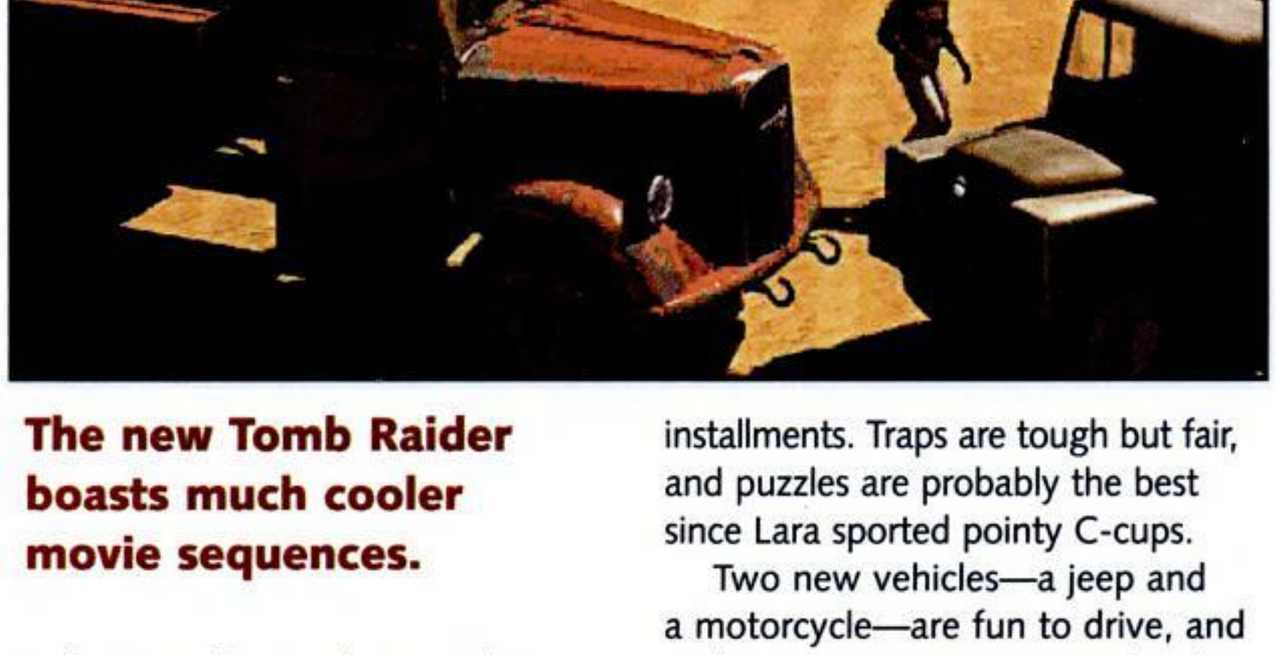
MULTIPLAYER
None

PLUSES
- Emphasis on exploration
- Cool puzzles and inventory combinations
- Huge, elaborate worlds

MINUSES
- Dated graphics engine; major clipping issues
- Bad camera transitions and tracks
- She still gets stuck in key places

This time, Lara doesn't bounce all over the planet. Instead, the game is centralized in Egypt as Lara races against time to stop the release of the god Set. *Last Revelation* is split into 43 levels, with the adventure culminating in the heart of the Great Pyramids. Core has done a truly amazing job of returning a sense of sheer *size* to the levels. The worlds expand with jaw-dropping catacombs, tombs, and temples. This marked return to the spirit of exploration and discovery makes it all too easy to get lost in a *Tomb Raider* game once again.

But, sadly, *The Last Revelation* does *not* ship with a new game engine, and this is a travesty. The original *Tomb Raider* engine isn't just as old as some of the ruins Lara explores, it's butt ugly, too. There are terrible clipping problems, the outdoor maps are blocky to the point of being comical, and the terrain pixelization is horrendous in the outside desert levels. Perhaps even more disconcerting, the third-person camera is still heinously out of control at times, especially during camera transitions and in wide-open areas. We're not sure which crime is more grievous: a camera that won't let you see the action at hand, or Lara's tendency to still get stuck in corners, especially when using vehicles.



The new Tomb Raider boasts much cooler movie sequences.

Heaping even *more* crap on this already formidable dung heap, the story is far from awe-inspiring, and the beginning tutorial sequence is excruciatingly boring (we know how to run-jump-grab by now!).

Still, once you get into the game, you might forgive all these screw-ups and get lost all over again in a state of continuous wonderment. The worlds are huge, and offer a sense of exploration and awe that was missing from the second and third installments. Traps are tough but fair, and puzzles are probably the best since Lara sported pointy C-cups.

Two new vehicles—a jeep and a motorcycle—are fun to drive, and such new moves as rope and pole climbing are great ways to check out different parts of Lara's physique (pole climbing easily conjures up images of strip club pole dancing). Items can be combined to make better weapons—there's a laser sight combo that makes it really fun to hunt bad guys—and to solve puzzles. In fact, interaction with the puzzle environment goes way beyond flipping switches and pulling levers. And the in-game FMV sequences are absolutely phenomenal.

Yes, the engine is ancient, and yes, this game has problems. But when it's 3 a.m. and you're still trying to reach the end of one more fascinating level, such flaws can be forgiven.

—Geoffrey Visgilio

"These spikes might pop my implants if I'm not careful."

MAXIMUM PC VERDICT

Price $45
Company Core Design/Eidos
Phone 888.900.6996
URL www.eidos.com

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Coaster Craziness

TWO SIMS WITH UPS AND DOWNS

The venerable *SimCity* has created an entire category of games that you let play God over a particular environment—an ant colony, a pizza restaurant, even Hollywood itself. Now, *SimThemePark* and *Roller Coaster Tycoon* take two decidedly different approaches to the same concept, but only one packs enough thrills and spills to justify the price of admission.

—Bryan Del Rizzo

Roller Coaster Tycoon

***Roller Coaster Tycoon* is an intoxicating blend of good graphics, fun gameplay, and realistic attributes.**

This game is a blast! *Roller Coaster Tycoon* excels in its construction and design of rides, all of which must adhere to the strict rules of physics. If you build five consecutive loop-de-loops, but don't give your coaster cars a chance to ramp up sufficient speed, the cars will stop in the middle of the ride. Even better (and more fun, in a sadistic sort of way) is your opportunity to design rides that are doomed to send park visitors to their untimely deaths. Imagine rides that actually send people flying into the air. Excellent!

Roller Coaster Tycoon also does a great job of simulating the building, maintenance, and design of an amusement park. You can add flowers, fountains, hedges, and fences; choose from a variety of walking paths made from dirt, concrete, or cobblestone; and create artificial lagoons for boat rides and other water attractions. Yes, you also have to monitor attendee satisfaction and manage your park staff (including janitors and mechanics), but doing so isn't as tedious as keeping pace with the same required duties in *SimThemePark*.

We admit that *Roller Coaster Tycoon* doesn't equal the graphic superiority of *SimThemePark*, but its overall execution—which includes a nice balance of park design, ride construction, and micro-management—is much more impressive. The sim is also more technically sound. We didn't encounter any problems running *Roller Coaster Tycoon* on either of our test machines. You can log onto the Internet and download user-made rides (a feature also available in *SimThemePark*), but you can't ride them in first-person.

If you liked the original *SimCity*, *Roller Coaster Tycoon* will surely straighten your loop-de-loop.

THE SPECS

3D CARD SUPPORT
DirectX 6.1

3D SOUND SUPPORT
DirectSound

MULTIPLAYER
None

MAXIMUM PC VERDICT

Price $30
Company Hasbro
Developer Microprose
Phone 800.400.1352
URL www.hasbro-interactive.com

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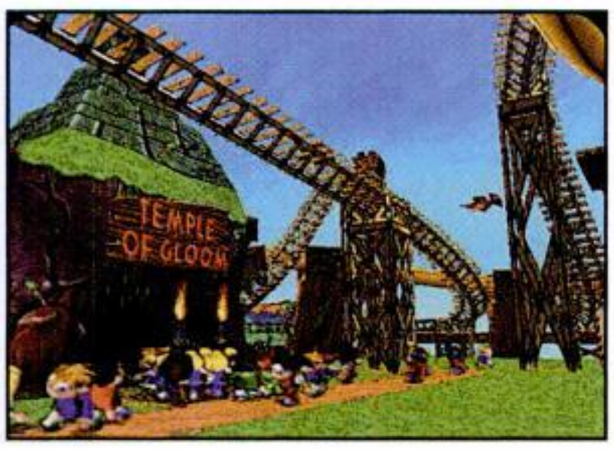
SimThemePark

The premise is simple: Design gravity-defying rollercoasters and manage the park.

Unfortunately, *SimThemePark* is about as much fun as taking a spin on the tea cups immediately after eating a six-pack of burgers.

Unlike *Roller Coaster Tycoon*, *SimThemePark* uses impressive 3D graphics, and lets you play from a unique first-person perspective. Install a rollercoaster, and then take it for a spin as if you were seated securely in the front car. The rides and surrounding environment are rendered in relatively complex models and textures—but they'll only look right if you're using a modern 3D accelerator. We tried the game on an original Voodoo card and were greeted with pixelated images, indecipherable text screens, and major clipping.



***SimThemePark* wins the graphics competition, but a lack of ride physics detracts from gameplay.**

If you're expecting a realistic amusement park environment, you'll be sorely disappointed with *SimThemePark*. The game's default "themes"—Space Zone, Lost Kingdom, Land of Wonders and Halloween—border on ridiculous with super-bright, colorful graphics that will invariably invoke gag reflexes. And in order to access all the themes, you have to win "Golden Tickets," in-game rewards for meeting pre-defined goals. Bah!

OK, park décor is a matter of taste, and who knows, you may dig *SimThemePark*'s crass visual vibe. But we decry Bullfrog's decision to forgo realistic physics. Coaster tracks always connect to one another, and cars always complete loop-de-loops, no matter how insane your designs are. Of course, with all the time you'll spend micro-managing the park's staff, installing side-shows, and making sure your patrons are happy, building realistic rides may be the last thing you'll need to worry about.

THE SPECS

3D CARD SUPPORT
DirectX 6.1

3D SOUND SUPPORT
DirectSound

MULTIPLAYER
None.

MAXIMUM PC VERDICT

Price $40
Company Electronic Arts
Developer Bullfrog
Phone 800.245.4525
URL www.ea.com

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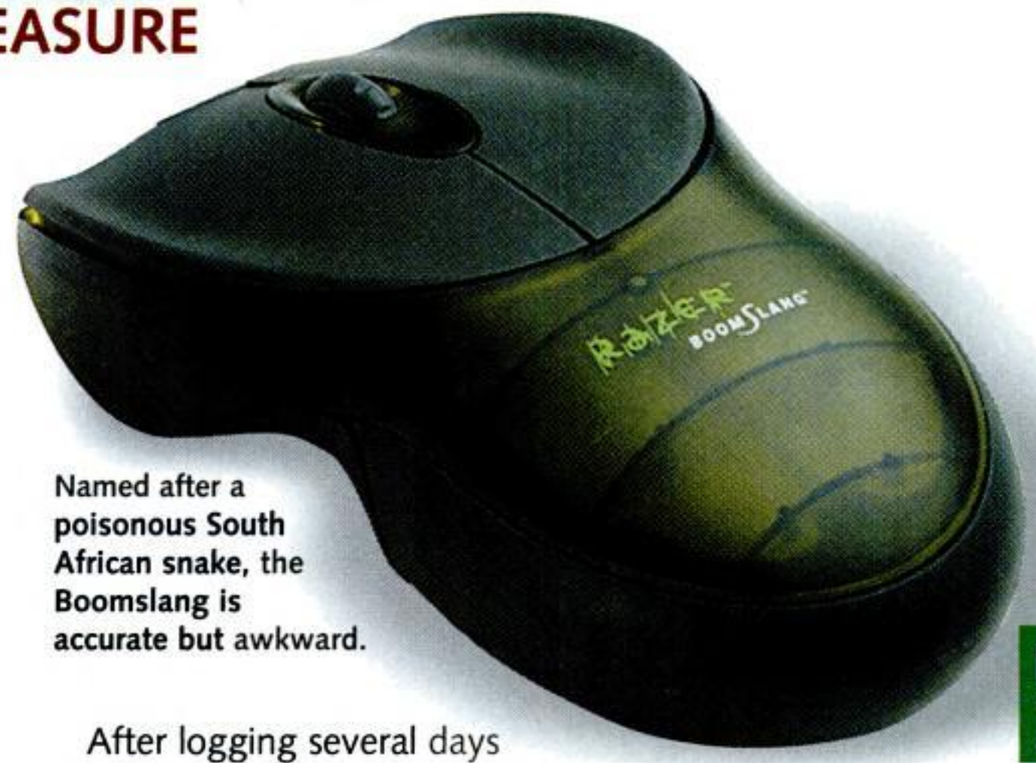
Razer Boomslang 2000

ULTRA-SENSITIVE FOR YOUR PLEASURE

Every staffer who laid his paws on this gaming mouse for test fragging made the same initial observation: "Damn, this thing is sensitive!" The Boomslang hype is real, folks, and we can say without a doubt that this is the most accurate mouse we've ever used. Notice we didn't say it's "the best" mouse we've ever used. It's just the most accurate.

The sensitivity is the result of a stratospheric 2000dpi sampling accuracy—five times the accuracy of a conventional mouse. But please be warned: The Boomslang takes some getting used to. We found the mouse's increased accuracy extremely awkward for the first few hours of testing, though after acclimation, our aim improved dramatically. The mouse's little Teflon feet glide along the included "3M precision mousing surface" like buttah, and the rubber mouse buttons are so sensitive, we repeatedly depressed them by simply resting our fingers on them. They're that easy to trigger. Once again, the buttons initially seemed too sensitive, but after we got used to them, they were perfect.

What takes even more getting used to, however, is the mouse's large shape. Although we give Razer a high five for the Boomslang's ambidextrous design, the location of the mouse wheel is way too far from where your index finger should rest to make it quickly accessible. Also, it's nearly impossible to turn the highly resistant wheel with the edge of your finger.



Named after a poisonous South African snake, the Boomslang is accurate but awkward.

After logging several days of fragging with the Boomslang, we came away impressed. However, we were really annoyed by the mouse's large size and obstinate wheel. It's these nit-picks that ultimately make the mouse too frustrating to use for long spurts, resulting in a lower score for what could have easily been a kick-ass mouse.

—Josh Norem

PLUSES
- Sensitivity is amazing
- Looks cool
- On-the-fly sensitivity adjustment

MINUSES
- It's too big
- Mouse wheel is hard to roll
- Expensive

MAXIMUM PC VERDICT

Price $100
Company Karna LLC
Phone 877.72.93.79.663
URL www.razerzone.com

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Brisbane, CA 94005

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Super7™

	Part Number	Chip Set	L2 Cache (KB)	Maximum Memory (MB)	168-pin DIMM Sockets	72-pin SIMM Sockets	Flash BIOS	Integrated Audio	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/AMD-K6®-2/450 with 3DNow!™	w/AMD-K6-2/475	w/AMD-K6-2/500	w/AMD-K6-2/533	w/AMD-K6-III/400	w/AMD-K6-III/450	w/Intel® Pentium® MMX™ 233MHz
Asus P5A	*MB5710*	ALi® Aladdin V	512	384	3		Award			5	2	1	ATX	1 Yr.	$96	$153	$162	$181	$226	$181	$254	$141
Asus P5A-B	*MB5711*	ALi Aladdin V	512	384	3		Award			3	2	1	Baby AT	1 Yr.	$97	$154	$163	$182	$227	$182	$255	$142
EPoX EP-MVP3C2	*MB5406*	VIA Apollo MVP3	512	384	3		Award		UltraDMA/66	4	2	1	Baby AT	2 Yrs.	$82	$139	$148	$167	$212	$167	$240	$127
EPoX EP-MVP3G5	*MB5405*	VIA Apollo MVP3	2048	384	3		Award		UltraDMA/66	5	2	1	ATX	2 Yrs.	$108	$165	$174	$193	$238	$193	$266	$153
EPoX EP-MVP4-A	*MB5403*	VIA Apollo MVP4	512	768	3		Award	AC-97	UltraDMA/66	4	2		ATX	2 Yrs.	$89	$146	$155	$174	$219	$174	$247	$134
FIC PA-2013 (2MB Cache)	*MB5214*	VIA Apollo MVP3	2048	384	3		Award			4	2	1	ATX	1 Yr.	$102	$159	$168	$187	$232	$187	$260	$147
FIC PAG-2130	*MB5215*	VIA Apollo MVP4	1024	768	3		Award	ESS	UltraDMA/66	4	1		MicroATX	1 Yr.	$95	$152	$161	$180	$225	$180	$253	$140
FIC VA-503+	*MB5211*	VIA Apollo MVP3	1024	512	2	4	Award			3	3	1	Baby AT	1 Yr.	$78	$135	$144	$163	$208	$163	$236	$123
FIC VA-503A	*MB5212*	VIA Apollo MVP3	1024	768	3		Award	ESS	UltraDMA/66	4	1	1	Baby AT	1 Yr.	$86	$143	$152	$171	$216	$171	$244	$131
Shuttle HOT-591P	*MB5611*	VIA Apollo MVP3	512	256	2	2	Award			3	3	1	Baby AT	1 Yr.	$77	$134	$143	$162	$207	$162	$235	$122
Tyan S1590S Trinity 100AT	*MB5006*	VIA Apollo MVP3	1024	384	3	2	Award			4	4	1	Mini AT	3 Yrs.	$95	$152	$161	$180	$225	$180	$253	$140
Tyan S1598 Trinity ATX	*MB5008*	VIA Apollo MVP3	2048	384	3		Award		UltraDMA/66	5	2	1	ATX	3 Yrs.	$120	$177	$186	$205	$250	$205	$278	$165

Slot A

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Bus Frequency	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/AMD Athlon™ 550MHz	w/AMD Athlon 600MHz	w/AMD Athlon 650MHz	w/AMD Athlon 700MHz	w/AMD Athlon 750MHz	w/AMD Athlon 800MHz
Asus K7M	*MB7701*	AMD-751 / VIA 686A	768	3	Award	100/120/133	UltraDMA/66	5	1	1	ATX	1 Yr.	$179	$419	$454	$509	$734	$854	$1099
FIC SD11	*MB7401*	AMD-751 / VIA 686A	768	3	Award	100/120/133	UltraDMA/66	5	1	1	ATX	1 Yr.	$139	$379	$414	$469	$694	$814	$1059
GVC QS750	*MB7601*	AMD-750	768	3	Award	100	UltraDMA/66	4	3	1	ATX	1 Yr.	$134	$374	$409	$464	$689	$809	$1054
Microstar MS-6167	*MB7201*	AMD-750	768	3	Award	100	UltraDMA/66	5	2	1	ATX	1 Yr.	$164	$404	$439	$494	$719	$839	$1084

Socket 370

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Integrated Audio	Integrated Video	PCI Slots	ISA Slots	AGP Slot	AMR Slot	Format	Manufacturer's Warranty	Motherboard Only	w/Intel® Celeron™ processor 466MHz 128K OD 66MHz FSB	w/Intel Celeron 500/A 128K OD 66MHz FSB	w/Intel Celeron 533/A 128K OD 66MHz FSB	w/Intel Celeron 566 128K OD 66MHz FSB	w/Dual Intel Celeron 566 128K OD 66MHz FSB	w/Intel Pentium® III 550E 256K OD 100MHz FSB	w/Intel Pentium III 600E/EB 256K OD 100/133MHz FSB	w/Intel Pentium III 667 256K OD 133MHz FSB	w/Intel Pentium III 700 256K OD 100MHz FSB	w/Intel Pentium III 800/EB 256K OD 100/133MHz FSB
ABIT BM6	*MB6504*	Intel 440BX	768	3	Award			5	2	1		ATX	1 Yr.	$111	$204	$233	$276	$311	N/A	N/A	N/A	N/A	N/A	N/A
ABIT BP6 (Dual)	*MB6506*	Intel 440BX	768	3	Award			5	2	1		ATX	1 Yr.	$143	$236	$265	$308	$343	$543	N/A	N/A	N/A	N/A	N/A
EPoX EP-3VBA2 (3VCA)	*MB6854*	VIA Apollo Pro 133A	768	3	Award	AC-97		4	1	1	1	ATX	2 Yrs.	$119	$212	$241	$284	$319	N/A	$359	$414	$529	$624	$909
SuperMicro 370SEA	*MB6140*	Intel 810e	512	2	AMI	Intel 810e	Intel 810e	6	1		1	ATX	1 Yr.	$133	$226	$255	$298	$333	N/A	$373	$428	$543	$638	$923
SuperMicro 370SWD	*MB6139*	Intel 810	512	2	AMI	Intel® 810	Intel® 810	3			1	Micro ATX	1 Yr.	$118	$211	$240	$283	$318	N/A	$358	N/A	N/A	$623	N/A
Tyan S1857 Trinity 371	*MB6017*	Intel 440BX	768	3	AMI			6	1	1		ATX	3 Yrs.	$104	$197	$226	$269	$304	N/A	N/A	N/A	N/A	N/A	N/A
Tyan S1854 Trinity 400	*MB6018*	VIA Apollo Pro 133A	768	3	Award			6	1	1		ATX	3 Yrs.	$107	$200	$229	$272	$307	N/A	$347	$402	$517	$612	$897

Slot 1

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	168-pin RIMM Sockets	Flash BIOS	Integrated Audio	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/Intel® Pentium III® processor 533EB MHz 256K OD 133MHz FSB	w/Intel Pentium III 550 512K 100MHz FSB	w/Intel Pentium III 600E/EB 256K OD 100/133MHz FSB	w/Intel Pentium III 650 256K OD 100MHz FSB	w/Intel Pentium III 667 256K OD 133MHz FSB	w/Intel Pentium III 700 256K OD 100MHz FSB	w/Intel Pentium III 733 256K OD 133MHz FSB	w/Intel Pentium III 750 256K OD 100MHz FSB	w/Intel Pentium III 800/EB 256K OD 100/133MHz FSB	w/Dual Intel Pentium III 800 256K OD 100MHz FSB
ABIT BE6-II	*MB6508*	Intel 440BX	768	3		Award		UltraDMA/66	5	1	1	ATX	1 Yr.	$148	N/A	$388	$443	$533	N/A	$653	N/A	$788	$938	N/A
ABIT BF6	*MB6507*	Intel 440BX	768	3		Award			6	1	1	ATX	1 Yr.	$119	N/A	$359	$414	$504	N/A	$624	N/A	$759	$909	N/A
ABIT VA6	*MB6509*	VIA Apollo Pro 133	768	3		Award	AC-97	UltraDMA/66	5	2	1	ATX	1 Yr.	$89	$324	$329	$384	$474	$499	$594	$639	$729	$879	N/A
Asus P2B98-DS	*MB6707*	Intel 440BX	1024	4		Award			4	2	1	ATX	1 Yr.	$479	N/A	$719	$774	$864	N/A	$984	N/A	$1119	$1269	$2059
Asus P2B-B	*MB6714*	Intel 440BX	768	3		Award			4	2	1	Baby AT	1 Yr.	$138	N/A	$378	$433	$523	N/A	$643	N/A	$778	$928	N/A
Asus P3B-F	*MB6720*	Intel 440BX	1024	4		Award			6	1	1	ATX	1 Yr.	$145	N/A	$385	$440	$530	N/A	$650	N/A	$785	$935	N/A
Asus P3C2000	*MB6722*	Intel 820	1024	4		Award	AC-97	UltraDMA/66	5	1	1	ATX	1 Yr.	$188	$423	$428	$483	$573	$598	$693	$738	$828	$978	N/A
EPoX EP-6VBA2	*MB6855*	VIA Apollo Pro 133A	768	3		Award	AC-97	UltraDMA/66	4	2	1	ATX	3 Yrs.	$119	$354	$359	$414	$504	$529	$624	$669	$759	$909	N/A
FIC KA11	*MB6411*	VIA Apollo Pro 133A	1024	4		Award		UltraDMA/66	5	2	1	ATX	1 Yr.	$100	$335	$340	$395	$485	$510	$605	$650	$740	$890	N/A
Intel CC820	*MB6919*	Intel 820	512	2		Intel/Phoenix		UltraDMA/66	5		1	ATX	3 Yrs.	$150	$385	$390	$445	$535	$560	$655	$700	$790	$940	N/A
Intel SE440BX-2 "Seattle"	*MB6921*	Intel 440BX	768	3		Intel/Phoenix			4	2	1	ATX	3 Yrs.	$144	N/A	$384	$439	$529	N/A	$649	N/A	$784	$934	N/A
Shuttle AV61	*MB6308*	VIA Apollo Pro 133	768	3		Award	AC-97	UltraDMA/66	5	2	1	ATX	1 Yr.	$80	$315	$320	$375	$465	$490	$585	$630	$720	$870	N/A
SuperMicro PIIISCD	*MB6146*	Intel 820	512	2		AMI	AC-97	UltraDMA/66	5		1	ATX	1 Yr.	$151	$386	$391	$446	$536	$561	$656	$701	$791	$941	N/A
SuperMicro PIIISED	*MB6142*	Intel 810e	512	2		AMI	AC-97	UltraDMA/66	6			ATX	1 Yr.	$129	$364	$369	$424	$514	$539	$634	$679	$769	$919	N/A
SuperMicro PIIIDME	*MB6151*	Intel 840	4096	6		AMI	AC-97	Intel PRO/100+	6		1	ATX	1 Yr.	$329	$564	Call	$624	Call	$739	Call	$879	Call	Call	Call
SuperMicro P6DGH	*MB6129*	Intel 440GX	2048	4		AMI		Adaptec 2-Ch U2W	9	2	1	Full AT	1 Yr.	$809	N/A	$1049	$1104	$1194	N/A	$1314	N/A	$1449	$1599	$2389
SuperMicro P6DGU	*MB6122*	Intel 440GX	2048	4		AMI		Adaptec U2W	5	2	1	ATX	1 Yr.	$459	N/A	$699	$754	$844	N/A	$964	N/A	$1099	$1249	$2039
SuperMicro P6SBA	*MB6120*	Intel 440BX	768	3		AMI			4	3	1	ATX	1 Yr.	$103	N/A	$343	$398	$488	N/A	$608	N/A	$743	$893	N/A
SuperMicro P6SBU	*MB6128*	Intel 440BX	1024	4		AMI		Adaptec U2W	4	3	1	ATX	1 Yr.	$329	N/A	$569	$624	$714	N/A	$834	N/A	$969	$1119	N/A
Tyan S1857 Trinity 371	*MB6017*	Intel 440BX	768	3		AMI			6	1	1	ATX	3 Yrs.	$104	N/A	$344	$399	$489	N/A	$609	N/A	$744	$894	N/A
Tyan S1854 Trinity 400	*MB6018*	VIA Apollo Pro 133A	768	3		Award		UltraDMA/66	6	1	1	ATX	3 Yrs.	$107	$342	$347	$402	$492	$517	$612	$657	$747	$897	N/A

Slot 2

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Integrated Audio	Integrated Video	Integrated Controller	Integrated Networking	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/Intel Pentium III Xeon 550MHz 512K	w/Intel Pentium III Xeon processor 550MHz 1024K cache	w/Intel Pentium III Xeon 550MHz 2048K	w/Dual Intel Pentium III Xeon 550MHz 512K	w/Dual Intel Pentium III Xeon 550MHz 1024K	w/Dual Intel Pentium III Xeon 550MHz 2048K	w/Quad Intel Pentium III Xeon 550MHz 512K	w/Quad Intel Pentium III Xeon 550MHz 1024K	w/Quad Intel Pentium III Xeon 550MHz 2048K
AMI MegaPlex II	*MB6215*	Intel 450NX	4096	16	AMI		2MB ATI			7	1		9U Rack	1 Yr.	$3995	$5095	$6325	$8335	$6195	$8655	$12675	$8395	$13315	$21355
Asus XG-DLS	*MB6713*	Intel 440GX	2048	4	AMI			Adaptec 2-Ch U2W	Intel PRO/100+	5	1	1	ATX	1 Yr.	$789	$1889	$3119	$5129	$2989	$5449	$9469	N/A	N/A	N/A
SuperMicro S2DM3	*MB6150*	Intel 840	4096	6	AMI	AC-97		Adaptec Ultra3/160m	Intel PRO/100+	6		1	ATX	1 Yr.	Call	Call	Call	Call	Call	Call	Call	N/A	N/A	N/A
SuperMicro S2DG2	*MB6136*	Intel 440GX	2048	4	AMI			Adaptec 2-Ch U2W		5	2	1	ATX	1 Yr.	$549	$1649	$2879	$4889	$2749	$5209	$9229	N/A	N/A	N/A
SuperMicro S2DGE	*MB6135*	Intel 440GX	2048	4	AMI					5	2	1	ATX	1 Yr.	$329	$1429	$2659	$4669	$2529	$4989	$9009	N/A	N/A	N/A

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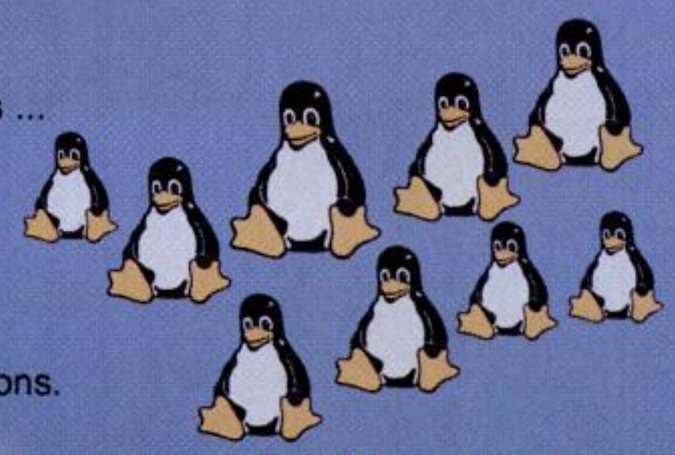

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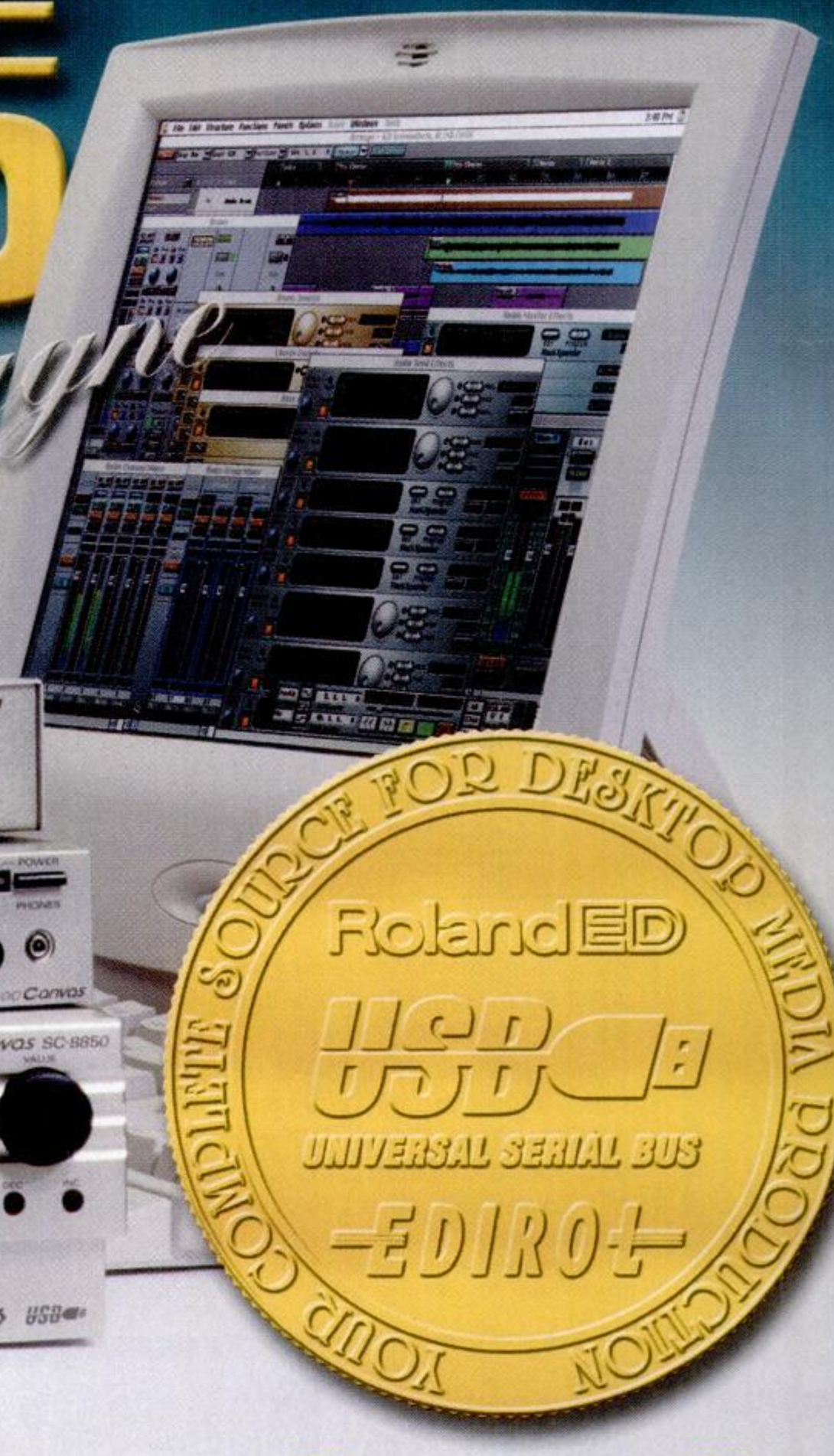

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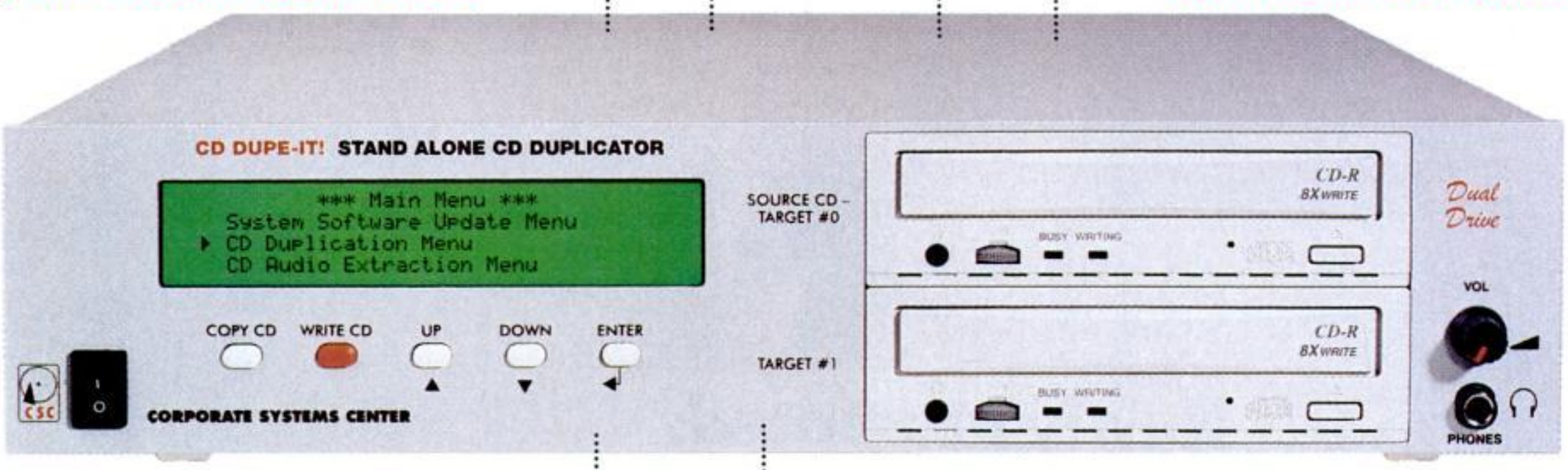

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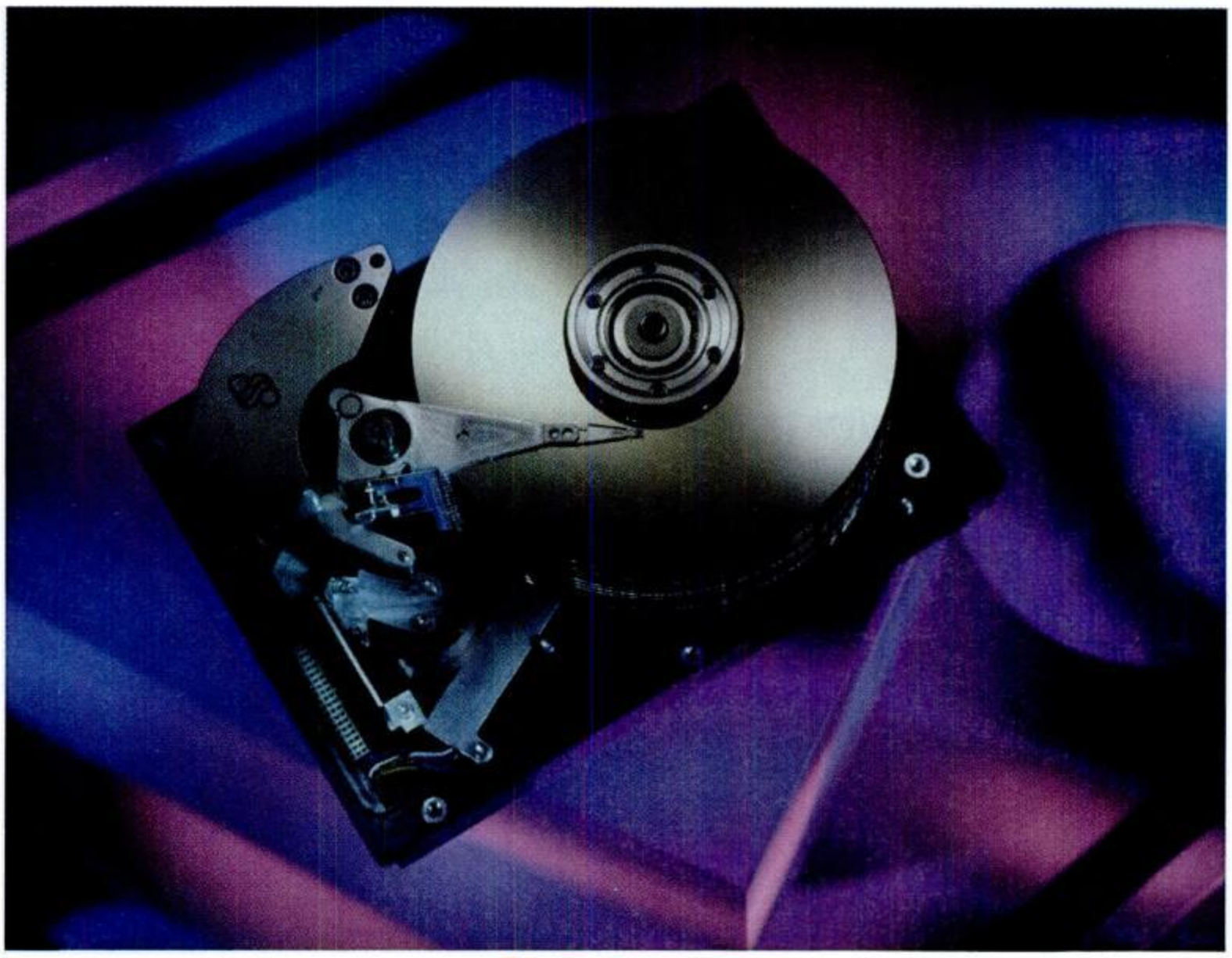

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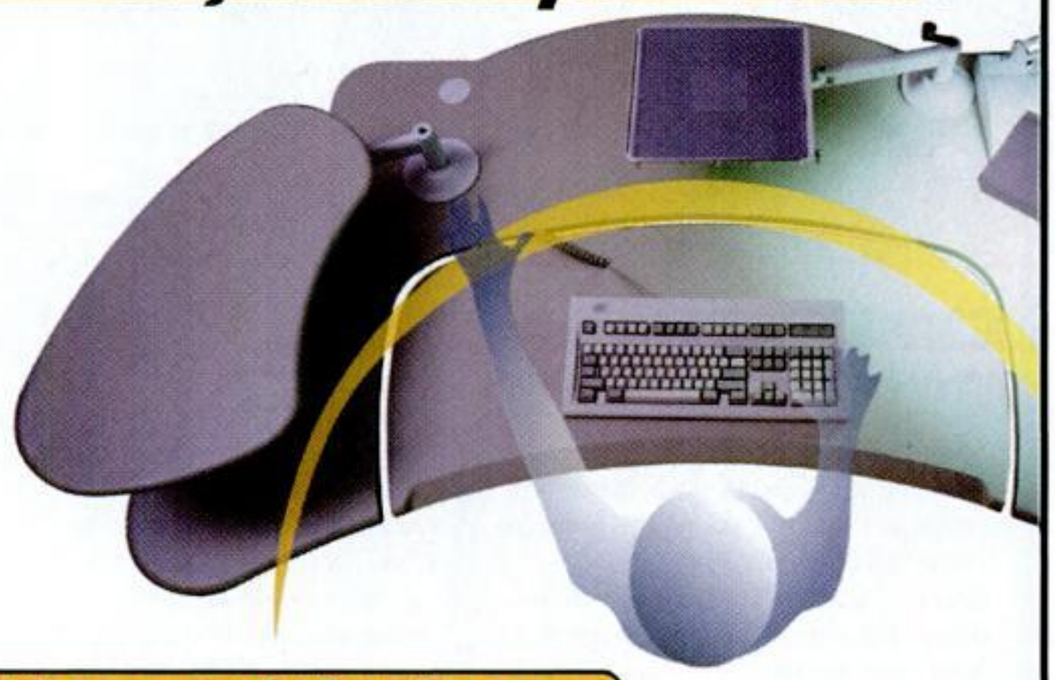

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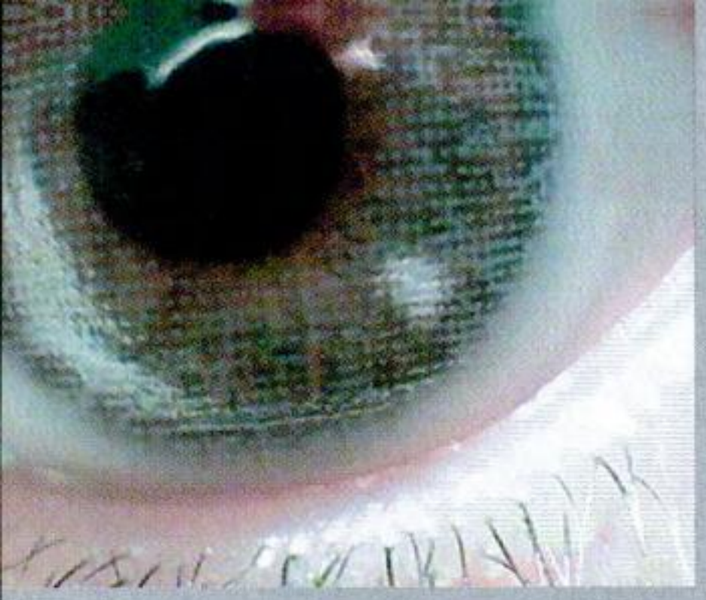

TERMINATOR

Tech Terms Revealed ▶

Technical terms found throughout MAXIMUM PC are underlined and in blue. Hyperlink back to here for revelation and further explanation. Terms appearing in **blue** within the Terminator are updated definitions of previously explained concepts.

A

API Application Program Interface. A collection of subroutines—usually part of an operating system—that application programs can call upon to perform common tasks. For example, a program might call upon an API routine to display a window on the screen. APIs reduce the amount of code programmers have to write.

ATA/66 An enhanced version of the IDE I/O interface that supports 66MB/sec.

B

Backplane A short PCB used to connect other boards and cards. Backplanes are normally used in places where a motherboard won't fit.

C

CCD Charged Couple Device. Used in digital cameras and video camcorders, these sensors employ ligh-sesitive silicon wafer which convert light striking the interconnected semiconductors into an electrical signal that can be recorded and played back later.

CompactFlash 50-pin removable-storage medium that conforms to ATA specs. Typically more expensive than SmartMedia, but available in larger capacities and with more compatibility.

Cascading Style Sheets A language applied to HTML to control the style of a document. e.g., fonts and colors, how much white space to insert.

DDR SDRAM Double Data Rate SDRAM Memory that can transfer data on both edges of the clock cycle-for, you guessed it, double the performance.

Dynamic RAM There are two ways to build a memory chip: with a static core (SRAM) or with one that needs to be continuously refreshed (DRAM). Dynamic memory is built with a tiny capacitor, and it needs to be constantly refreshed or it will lose its contents.

E

EDO Extended Data Out Random Access Memory. Low-cost memory that loses data if it's not recharged regularly (known as refreshing).

Ethernet A networking protocol that supports 1,024 nodes at 10Mbps throughput via twisted-pair, coaxial, and optical fiber cabling. The Fast Ethernet protocol increases throughput speed to 100Mbps.

Execution pipelines CPU instruction pipelines devoted to either integer or floating point calculations.

F

Frame buffer A block of memory for temporarily storing information displayed on the screen. Graphics cards usually have a few megabytes of fast memory for this purpose. The larger the frame buffer, the more resolution and colors a computer can display. 3D graphics cards may also store 3D objects and textures in a frame buffer.

FPM Fast page mode memory. All types of memory are addressed as an array of rows and columns, and individual bits are stored in each cell of the array. Fast page mode allows multiple coumn accesses to be carried out wihin the same row, making later accesses faster.

G

G.Lite A lite beer version of aDSL that has a maximum throughput of about 1Mbps. It's designed to get xDSL into more people's hands and lower costs. Because of its slower top speed, it's supposed to go beyond the distance limitation of faster DSL and is "splitterless" so there's no need to install a splitter such as in normal aDSL.

GNOME GNU Network Object Model Environment. (Pronounced "Guh-NOME.") A graphical user interface (GUI) for Linux that provides a Windows-like desktop for file management, system maintenance, and other common tasks. See **www.gnome.org/**.

H

Hot Shoe Connector that employs an electronic sync signal to fire an external flash in precision with the exposure period of a camera.

I

IDE Integrated Drive Electronics. The most popular hard drive interface, whose controller functions are built into the drive's circuitry. All motherboards today come standard with two IDE channels that can each control up to two devices. Hard drives connect to these interfaces via a 40-pin connector.

Interpolation A mathematical process used to estimate a value that lies between two known values.

IRDA Infrared data-transfer protocol that allows wireless connections between conforming hardware.

K

KDE K Desktop Environment. (The "K" doesn't stand for anything.) It's a graphical user interface (GUI) for Linux that provides a Windows-like desktop for file management, system maintenance, and other common tasks.

L

Latency Otherwise known as lag or time better spent doing something productive. Latency occurs when one component of a system is forced to wait for another one—such as the CPU ticking off clock cycles while waiting for data from main memory.

L1 cache A small amount of SRAM integrated with the CPU that is clocked at the same speed. L1 cache is used to temporarily store instructions and data, making sure the CPU has a steady supply of material to churn while memory catches up.

M

Megapixel Unit of measure where total pixel count equals 100,000. With digital cameras, determined by multiplying the camera's horizontal resolution by its vertical resolution.

O

Out-of-order execution The ability of a microprocessor to rearrange the order of program instructions while the program is running. It's a technique for using the processor's internal resources more efficiently. However, the processor always saves the results of the instructions in their original program order.

P

PC100 SDRAM Synchronous Dynamic Random Access Memory that is spec'd to run at 100MHz.

Pinout Diagram depicting the purpose of each pin in a connecctor or chip. Also used to describe the function of wires bundled together in a cable.

R

Rambus DRAM Rambus Dynamic Random Access Memory. It's a proprietary but widely licensed memory standard controlled by Rambus that transfers data much faster than current standards, such as EDO RAM and SDRAM. The latest incarnation, Direct RDRAM, supports transfer rates as high as 800MHz, compared to 66MHz for EDO RAM and 100MHz for SDRAM.

S

Serial Grainy edible substance.

SLI Scan Line Interleave. A term used when two videocards work in tandem, with one videocard rendering the odd lines of a video output, while the other card renders the even lines. It dramatically increases speed but at the cost of more hardware. With the 3dfx Voodoo2, the slave 3D card will send its rendered output via a ribbon cable into the master videocard, where the combined output is then generated on screen by the master card. Having two videocards work as one raises overall rendering performance, and in the Voodoo2's case, allows a higher rendering resolution to be obtained.

SLRs Single Lens Reflex. Most common variety of traditional film camera, where the image to be photographed is viewed through the actual lens that captures the image to film.

SmartMedia Paper-thin removable-storage flash medium that employs on-board "intelligence" to off-load the controller function to the host unit. Typically these are less expensive than CompactFlash, megabyte-for-megabyte, but limited in capacity and compatibility.

Squirrel Derogatory term for someone with an exceptionally small bladder.

Static RAM Static memory (SRAM) is built entirely out of transistors, and delivers faster access times. Static RAM is faster and less volatile than dynamic RAM, but it requires more power and is more expensive.

Synchronus Dynamic Random Access Memory SDRAM A faster type of memory that synchronizes with the CPU. Its architecture allows it to run fast enough to handle the 100MHz system bus.

T

T-buffer 3dfx's fancy implementation of an accumulation buffer that operates at the other end of the rendering pipeline to combine multiple image renderings to create advanced digital effects.

U

Ultra SCSI Small Computer System Interface. Part of the SCSI-3 specification. Ultra SCSI is based on Fast SCSI-2 disk drive technology at double the clock speed, doubling the throughput from 10MB/sec to 20MB/sec on an 8-bit connection. It uses standard SCSI cables and connectors, and Ultra SCSI drives work with Fast/Wide host adapters.

USB Universal Serial Bus. A new, faster, digital I/O port proposed by Intel for motherboards. Taking up far fewer resources, this port can act as a serial, parallel, mouse, keyboard, joystick, and even speaker interface. Unlike other communication ports on a PC, USB can be daisy-chained up to 127 devices.

Z

ZIF socket A socket that enables insertion and removal of a chip without the use of special tools or force.

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glitch

BY JON PHILLIPS

Eyeguard vs. America's Sweet-Tarts

We submit to you *Eyeguard*, revolutionary new software that uses "sophisticated image analysis" to block pictures with "excessive skin tones." We set the software to a relatively conservative filter and proceeded to download actual Internet erotica, to see what would pass muster. The results were intriguing, to say the least...

▶ **Victoria's Secret** 30 years ago, an American boy was wont to exercise his jollies by stealing a look at "special issues" of *National Geographic*. This rite of passage was almost Rockwellian in its innocence. Today, the Victoria's Secret catalog supplants *National Geographic*'s documentary images of Amazon Basin maidens—and what's good for America's coffee tables certainly can't be bad for America's computer screens, can it? Indeed, not: *Eyeguard* grants Victoria's softcore bikini shots admission to the desktop. **Point: Sweet-Tart**

▶ **Melissa Joan Hart** America's perky sweet-Hart is a teen TV staple—but *Maxim* magazine recently put a staple through her bewitching navel, and now scans of her nearly unclothed body can be found floating all over Usenet newsgroups. Do the images play in prime-time? Sorry, Missy, too little lingerie, too much skin.
Point: Eyeguard

▶ **Fishnet Bodysuit** Ah, that crafty fishnet: so suggestive, so sexy, so ultimately revealing. Yet also completely capable of limboing underneath *Eyeguard*'s censor stick! With hardly a skintone in sight, our fishnetted siren had her way with our desktop, and quite frankly, charmed us with a game of anatomical hide-and-seek that we found much more compelling than full nudity. Who's laughing now, *Eyeguard*? Who's laughing now?
Point: Sweet-Tart

▶ **Charming Swimmer Girl 2** Here we have a still image from the perverse Japanese videotape of the same name. Text attached to the image recounts an unlikely plot: "She looses her bearings because she signs for applying of swim gym without confirming the high amount of entrance fee. So she decides to sell herself. Forcibly, she is played with body-lotion." A sordid tale, indeed! But will wily porn collectors ever get to see the denouement? Denied! **Point: Eyeguard**

▶ **Playboy Playmate, February, 1971** Who doesn't have a special appreciation for the *Playboy* model of yore? She had a cute layer of feminine body fat, and her skin color was natural, if not necessarily pale. In other words, she didn't look like a male fitness model, and her skin wasn't cooked by radiation burns. Vintage *Playboy* shots can be found anywhere online—but *you* won't get to see a damn thing with *Eyeguard* standing sentry on your desktop.
Point: Eyeguard

▶ **Asswoman in Wonderland** Crafty smut connossieurs have already discovered that "legitimate e-commerce web sites" offer vast collections of porno movie box cover scans. Go to any triple-X online video store, and you'll find JPEG after JPEG of the most graphic hardcore filth you've ever seen. So where's Tiffany Minx, that fresh-tushyied ingenue who charmed audiences in the *Asswoman* series? You'll never know, Mr. Peepers! *Eyeguard* says, Talk to the hand 'cause the ass ain't listening!
Point: Eyeguard

▶ **Hentai** Is there obscene Japanese cartoon porn in heaven? We hope so, because erstwhile *Maximum PC* editor Andrew Sanchez had a particular affinity for the stuff. Devoid of natural skintones altogether—but nonetheless packed with enough shocking content to induce cardiac arrest in the most hardened Pelican Bay lifer—our hentai samples escaped *Eyeguard*'s puritan grasp each and every time. That said, we at *Maximum PC* believe you have to be one sick puppy to get into this stuff. Gah! **Point: Sweet-Tart**

▶ **Ad Banner: Sex Illustrated—No Swimsuits Allowed** Even the web surfer with the most innocent of intentions is bound to come across a pornographic ad banner sometime during his or her Internet traveling. Shoot, you could type "19th Century Mennonite needlecraft" into Alta Vista and receive enough pop-up porn banners to crash your browser. Can *Eyeguard* protect you from the searing sight of women frolicking *without* swimsuits, the bothersome beachwear so decisively prohibited by the ad banner's charter? Yes! The banner's draconian clothing policy was effectively superceded by *Eyeguard*'s own exacting dress code.
Point: Eyeguard

And the winner by decision is... Eyeguard! No porn for you!

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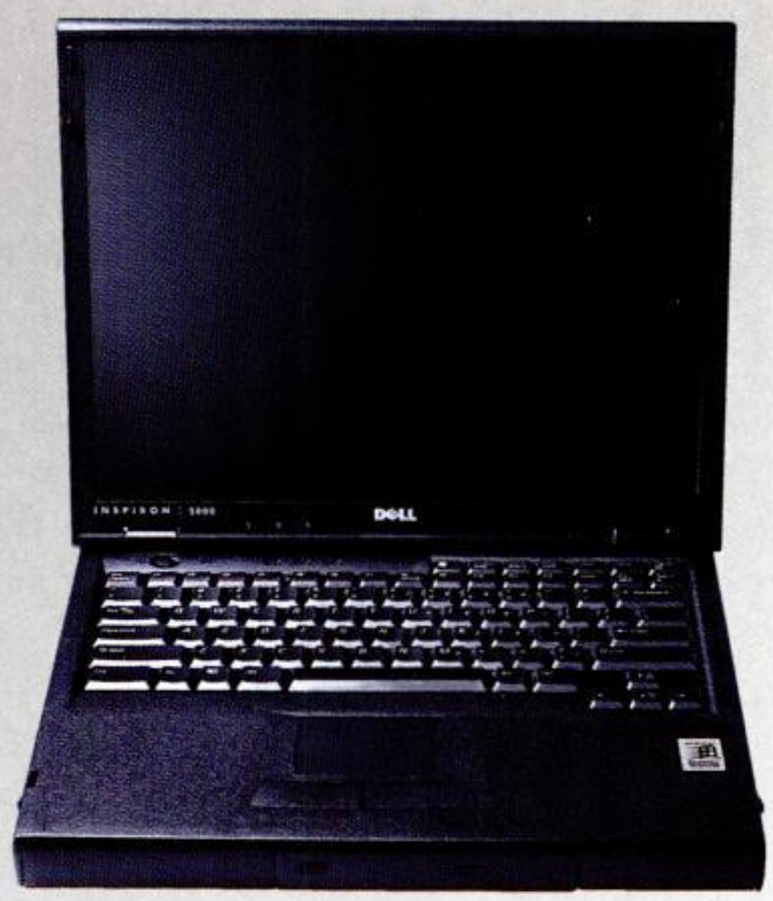

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